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PROPOSED 5-YEAR OUTER CONTINENTAL SHELF OIL AND GAS LEASING PROGRAM

JANUARY 1987 - DECEMBER 1991

Draft
Environmental Impact Statement

VOLUME 2

United States Department of the Interior
Minerals Management Service

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Environmental Impact Statement

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United States Department of the Interior
Prepared by Minerals Management Service

February 1986

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4. Western Gulf

a. Alternative I - Proposed Action

(1) Interrelationship of Proposal with Other Projects and Proposals

(a) National parks and sanctuaries

Padre Island National Seashore, established in 1962, is the only unit of the National Parks system along the shorefront of the area. Its purpose is "to save and preserve, for the purpose of public recreation, benefit, and inspiration, a portion of the diminishing undeveloped seashore of the United States that remains undeveloped." Padre Island is a barrier island situated between the Gulf of Mexico and the Laguna Madre. The seashore extends a linear distance of approximately 60 miles between Port Mansfield and a point several miles south of Port Aransas. Although there are some minor land adjustment proposals under consideration to complete Federal control and administration of this park, there are no plans for future linear expansion of the park. Oil and gas operations are ongoing within the park and near the park on State lands and water bottoms. Future OCS leasing should be compatible with the objectives and goals of the Padre Island National Seashore.

The designation of the Flower Garden Banks as a National Marine Sanctuary should not impact oil and gas leasing operations in the Western Gulf of Mexico; nor should oil and gas leasing activities impact the designation of the Flower Garden Banks. Within the proposed marine sanctuary boundaries (4-mile zone), protective measures are required of operators. These measures are designed to conserve the biota of the banks and would be required of lessees regardless of designations of a marine sanctuary at the Flower Garden Banks. No other existing or proposed marine sanctuaries exist in the WPA.

(b) Coastal zone management

The Coastal Zone Management Act (CZMA) of 1972 was enacted by the U.S. Congress in response to a need to manage land use in the coastal areas of the nation. Since the late 1950's the coastal regions have undergone accelerated residential, commercial, and industrial development that has stressed the physical, economic, and social systems at large. CZMA has provided each State and its political subdivisions the opportunity to plan for more orderly growth based on national objectives. Amendments in 1976 to CZMA require Federal postlease actions directly affecting the coastal zone to be consistent with State land management programs.

In the Gulf of Mexico Region all coastal States, with the exception of Texas, have established and maintained Federally approved CZM programs. Texas, while not under CZMA, has a centrally coordinated coastal management program.

The proposed action interrelates with CZM programs on the State and local level both directly and indirectly. Directly Federal OCS postlease permitting of plans of exploration and development generated by the proposal must be consistent with State CZM programs. To ensure this consistency, both Federal and State agencies review and approve permit applications. The proposed action could lead to the discovery/recovery of oil and gas resources that would require expansion of existing or construction of additional support facilities onshore. This induced development is an indirect result of the proposed action and must comply with both State CZM programs and the planning and implementation measures enacted by political subdivisions within each State. Local jurisdictions have immediate control over site-specific land use decisions.

(c) Military uses

The U.S. Navy and Air Force actively use nine military warning areas and five water test areas in the Gulf of Mexico. Five of these warning areas lie in the Central and Western Gulf, and four of these warning areas and the five water test areas lie in the Eastern Gulf. Military operations within these warning areas vary in the types of missions performed and their frequency of use. Such missions include carrier maneuvers, missile testing, rocket firing, pilot training, air-to-air gunnery, air-to-surface gunnery, minesweeping operations, submarine operations, air combat maneuvers, aerobatic training, missile testing and development, and instrument training. (Figure III.B.1.a.1.)

In the Central, Western, and Eastern Gulf, space-use conflicts could develop with increased USAF and Navy testing and training activities and unrestricted oil and gas development.

Other general site-specific stipulations have been developed, as necessary, to avoid conflicts and, in irreconcilable cases, areas could be deferred from lease sales.

(d) Ocean dumping

There is one ocean dumping site designated for the incineration of organohalogen wastes in the Gulf of mexico. This site, shown on Visual No. 11 and Figure I-2, is in the WPA.

The USEPA regulates ocean incineration under the authority of the Marine Protection Research, and Sanctuaries Act of 1972 (MPRSA) (33 U.S.C. 1401 et seq). The MPRSA prohibits the ocean dumping of wastes without a permit. In 1976, USEPA designated the Western Gulf ocean dumping site for the incineration of toxic wastes (41 RF 39319). This site was designated for a period of five years. Only one ship was permitted to burn at a time, except under extreme emergencies. In 1982, USEPA redesignated the ocean disposal site for continuing use (47 FR 17817). Except for transferring the management of the site to USEPA headquarters, the conditions of the use of the site remained the same as the 1976 designation. The Gulf Ocean Incineration Site is described in 40 CFR 228.12.b.1.

There has been limited burning in the Gulf. During 1974 and 1975, Shell conducted two research and two operational burns in the Gulf. This was the

first United States use of ocean incineration for the disposal of organochlorine wastes. Between 1974 and 1982, USEPA issued permits for three series of burns in the Gulf of Mexico. USEPA has developed proposed ocean incineration regulations based on the experience of these burns (50 FR 8222). All future burns will require a USEPA permit.
Due to the hazardous nature of the cargo involved, potential conflicts could exist between OCS oil and gas leasing activities and USEPA ocean incineration permitting activities. Recent leasing activity has shown an increased interest in deepwater blocks. Conflict could arise during transportation of the wastes to the offshore site and during burning. In transporting the wastes to the site, collision with rigs or vessels operating in presently leased blocks could occur. Navigation and safety regulations and the established fairways systems should minimize this risk.

Should be leasing occur within the designated incineration site, the potential would exist for conflict between these two uses within the site. Two potential hazards are evident in the burn site: collision between the incineration vessel and drilling rigs and human health risk due to the formation and emission of hazardous compounds which are not present in the original waste. These substances are products of incomplete combustion (PIC's). Two classes of PIC's which have been discovered in high temperature incineration devices are dioxins and furans, some of the most toxic materials known. The emissions from ocean incineration does not go through scrubbers to remove acid gas and particulate emissions as in land-based incineration; therefore, ocean emissions contain higher release quantities including PIC's. Potential hazards to rig workers could exist should incineration occur in their vicinity.

The marine transport of huge tonnages of materials has led to the development of ports and navigable waterways that could accomodate deep draft vessels. The development and maintenance of these ports and waterways requires extensive dredging of large volumes of sediments each year. There are all inshore in the vicinity of the Intracoastal Waterway or dredged channels and harbors.

Dredging entails the excavation of bottom material. The types of dredging devices fall into two classifications - hydraulic and mechanical. Mechanical dredges pick up material by various types of buckets. Hydraulic (or suction) dredges utilize a centrifugal pump which moves a slurry of water and material through a pipeline either into the hold of hoppers or to a distant discharge point.

The mechanical dredges discharge either alongside the place of excavation, or into barges. This type of dredge is used extensively around breakwaters, docks and piers in maintenance dredging. It is mostly applied to excavating soft and cohesive subaqueous materials as silts and stiff muds.

Each year dredging operations are carried out in major harbors and along the intercoastal waterways. The disposal of the dredged material varies from open ocean dumping sites, diked areas near shore and onshore dumping sites. Following is a brief summary of some of the major dredging operations that occur along the Gulf coast.

The Department of Defense's (DOD) explosives dumping areas found in the Gulf planning areas are shown on Figure III.B.1.a.1. Dumping consisted of old ordnance and unexploded (duds) shells and depth charges. No dumping has taken place in any explosive areas since 1969-1970. The U.S. Air Force (USAF) has released an indeterminable amount of unexploded ordnance in water test areas 1-5 as a result of testing and training missions. The potential for conflict exists between MMS approved oil and gas activities and EPA-permitted ocean incineration. The designated Gulf of Mexico incineration site is located generally in the Keathley Canyon leasing area. Coordination between EPA and MMS will take place in order to resolve any conflict of use which could result from the dual use of the area. For a further discussion of ocean dumping, see Section III.B.1.a. (Figure III B1A-1).

(2) Projects Considered in the Cumulative Impact Assessment

(a) Oil and gas activities (Federal and state)

The effects of Federal OCS (associated with prior sales) and State oil and gas activity are major considerations in the cumulative analysis.

Federal OCS activity considered in the cumulative analysis includes estimates of oil/gas reserves, numbers of platforms, pipeline mileage and landfalls, and onshore service/supply and processing infrastructure present at the beginning of the proposal as well as the number of exploration and development wells drilled, production platforms and pipelines installed (including landfalls), oil and gas production, and the use, expansion and addition of service/support and processing infrastructure (supply bases, platform fabrication yards, gas processing plants, etc.) which are estimated to occur during the period associated with the proposed action (i.e., subsequent to the initial sale included in the proposed action for the planning area being considered).

Similar, though less detailed cumulative scenario estimates on State oil and gas activities and related infrastructure are also considered in the cumulative analysis.

(b) Other major offshore activities

(i) Military operations

Ninety-six percent of the water and air space for the Eastern Gulf is used intensively and extensively by the Air Force, Navy, and Army for carrier operations, helicopter rocket firing, and missile testing and development. Ten percent of the water and air space of the Central Gulf is used extensively but not intensively by the Navy, Naval Reserve, and Air National Guard for carrier flight qualifications and pilot training. Thirty-seven percent of the water and air space of the Western Gulf is used by the Air Force and Navy for carrier flight qualifications, bombing runs, navigation exercises, and pilot training. Warning Area 228 is used intensively by the Navy within a radius of 150 miles of Corpus Christi and less beyond the 150-mile radius; Warning Area 602 is used extensively but infrequently by the Air Force. (Figures III B1A-1, 1B-1, and 1C-1).

(ii) Marine vessel traffic

The Gulf of Mexico is one of the busiest areas in the world for waterborne commerce. Vessels operating offshore often utilize the extensive network of established safety fairways within the Gulf. The fairways provide clear passage, 2 nmi in width, for vessels travelling to and from major Gulf ports. Many of the shallower draft vessels, especially barges, generally use the Gulf Intracoastal Waterway (GIWW) which follows most of the Gulf coastline inshore and through the bays and estuaries from Fort Myers,

Florida, to Brownsville, Texas. In 1981, there were 1,088,700 recorded vessel trips to and from Gulf ports; 61,207 in the Eastern, 768,160 in the Central, and 259,333 in the Western Gulf. Approximately 17,325, or 2%, of these trips were made by tankers.

(iii) Ocean dumping

There is one USEPA designated dump site in the Gulf of Mexico (see Figure III.B.1.a-1); it is designated for incinerationof hazardous wastes, but there are no active permits for incineration at sea. This site is located in deepwater seaward of the continental shelf. See Section III.B.1.a for a discussion of ocean dumping and ocean incineration.

(iv) Recreational fishing

Saltwater fishing is a marine recreational activity that is growing in participation and economic significance throughout the inshore, nearshore, and offshore zones of the Gulf of Mexico region. Results from the National Marine Fisheries Service's (NMFS's) Statistical Survey indicate that about 4 million salwater fishermen in the Gulf region made about 20 million fising trips during 1980. Fishing from boats is the most popular mode of marine recreational fishing in the Gulf region (over 50% of all fishing trips). In 1982, over 1.7 million motor boats, approximately one-fifth of the Nation's recreational boating fleet, were registered in the five States of the Gulf region. Over 700,000 of these motor boats are 16 feet or larger or potentially capable of navigating in the nearshore and offshore zones of the Gulf of Mexico.

The focus of most offshore fishing is around natural and artificial features where fish are likely to be located. Demand for artificial fishing reefs, especially in the Eastern Gulf, has increased in the last few years. Over 120 designated and permitted artificial fishing reefs composed of ships, barges, tires, and concrete rubble have been placed in the Gulf of Mexico over the past 25 years. Increasing interest in the reuse of obsolete oil and gas structures for artificial reefs has led to a Gulfwide interest in a rigs-to-reefs program. To date, about six oil and gas structures have been covered to permanent fishery enhancement devices on dedicated reef sites.

(v) Commercial fishing

NMFS landings data for 1977-1981 show approximately 1.68 billion pounds of finfish and shellfish with an annual dockside value of $429.8 million in the Central and Western Gulf. Important species landed commercially in the Gulf include shrimp, menhaden, blue crab, oyster, mackerels, drums, seatrouts, snappers, and groupers. There are approximately 27,336 commercial fishermen Gulfwide with processed fishing products amounting to about $515.3 million. The main processed fishery products include shrimp, menhaden, lobsters, oysters, and crabs.

(vi) Deepwater ports

The Louisian Offshore Oil Port (LOOP) is the only deepwater port in the Gulf of Mexico. LOOP's function is to facilitate the offloading of oil from vessels too large to visit conventional Gulf ports (typically supertankers with drafts greater than 40 feet and up to 700,000 dwt) and to transport the oil to shore via pipeline. In 1983, LOOP offloaded 140.9 million bbls of crude oil from 168 tankers. No motile drilling operations or installation of permanent structure may take place within LOOP's designated safety zone, fairway, or anchorage.

(vii) Nonenergy Minerals Program in the Gulf of Mexico

The Nonenergy Minerals program in the Gulf of Mexico is currently inactive. Earlier planning had tentatively called for a construction materials lease sale for January 1986; however, this schedule is no longer in effect and no new tentative sale date is known.

Interest in authorizing a lease sale in the Gulf of Mexico continues and legislation was introduced and passed the House of Representatives; however, the proposed bill in the Senate failed to pass out of committee in 1984. Future legislation may be introduced in the near future if local support for the measure is noted.

(viii) Operational discharges

Contamination from marine transportation activities occurs as a result of routine operational discharges and accidental spills. With respect to ships that maintain sizeable crews, the pollutants consist of large amounts of domestic waste products such as sewage, food waste, and trash from the human activities on board. For recreationsl vessels, sewage disposal from marine santitation devices in highly populated, confined harbors and anchorages is the primary pollution concern. Other problems are related to the movement of crude oil and concern offshore unloading terminals (deepwater ports) and identification of systems most reliable for transfer of oil from OCS production areas to shorewide facilities. Perhaps the most publicized source of pollution is operational discharge of oil by tankers in the merchant marine fleet. Because tankers cannot safely navigate ocean waters with empty tanks, they take on seawater as ballast after the cargo is discharged. When a ship gets close to its loading destination, the ballast water is discharged to make room for the oil cargo. Thus, the ballast seawater, contaminated with oil from the previous cargo or from tank washing, is sometimes intentionally discharged into the ocean. It has been estimated by MMS and others that the annual input of petroleum into the Gulf of Mexico, resulting from operational discharges, equals 59,000 bbls per year or 2.6% of the total amount of petroleum entering the Gulf annually (USDI, MMS, 1982a).

(ix) Import and domestic tankering activities

As was stated in Section IV.B.4.a(2)(b), under the topic Marine Vessel Traffic, the Gulf of Mexico is one of the busiest areas of the world in terms of utilization by waterborne commerce. Approximately 2% of the vessel trips recorded in 1981 were made by tankers, alone. Import and domestic tankering activities make up the bulk of these trips and have th potential for creating conflicts with OCS activities and structures. It is estimated that import tankering alone will result in the transport of some 24.4 billion bbls of oil in the Gulf over the next 50 years, and could result in the approximately 28 spills, greater than 1,000 bbls. For that same period, domestic tankering activities will transport some 3.8 billion bbls of oil and could result in approximately 4.2 spills, greater than 1,000 bbls.

(c) Major Onshore Activities in Coastal Areas

(i) Oil and gas facilities

The central and wetern coastal portions of the Gulf Coast have one of the highest concentrations of oil and gas activities and related and service-support processing infrastructure in the world. This onshore activity and infrastructure includes: exploratory/development drilling and production well sites and access canals and roads to these sites; oil and gas pipelines; oil refineries; gas processing plants; petrochemical plants; pumping and compressor stations; pipe coating and storage yards; platform and rig fabrication yards; service/support bases, including docking facilities; shipyards; service, repair, and maintenance service facilities; ports; and access channels to the Gulf. It is noted that with the exception of the exploratory/development/production well sites and related infrastructure, much of this onshore infrastructure is heavily used and, in some cases, is exclusively used (or owes its existence to) in support of offshore oil and gas activity, both in State and Federal waters.

Comprehensive information on the extent of oil and gas activities in the coastal area of the Gulf of Mexico region has not been compiled. For many activities, particularly those prior to 1950, information is scarce or lacking. In Louisiana, virtually all privately-owned lands in the coastal area have been leased for oil and gas development. For Louisiana, there are approximately 34,200 wells in the coastal area (which includes the following parishes: Cameron, Iberia, Jefferson, Lafourche, Orleans, Plaquemines, St. Bernard, St. Charles, St. John the Baptist, St Mary, Terrebonne, and Vermilion).

Access canals and pipelines to service onshore development are pervasive throughout the coasta area. Between 1978 and 1982, approximately

1,900 petroleum canals were dredged in coastal Louisiana to provide access to well sites. The typical dimensions of an oil and gas access canal, as indicated on permits, are as follows: a canal 1,200 feet long and 70 feet wide with a drill slip at the end measuring 345 by 160 feet. The cumulative linear extent of canals, including oil and gas access canals, in coastal Louisian has been estimated at 6,100 miles in 1984 (U.S. Army Corps of Engineers, 1984b). For pipelines, estimates of the total number and linear extent vary widely. Between October 1980 and January 1983, coastal use prmits were granted for 860 buried pipelines in the Louisian coastal area.

Canalization contributes directly to the loss of wetlands through dredging activities, spoil disposal and canal widening, and indirectly through hydrologic interruptions. Canals also act as conduits for the inland movement of comparatively saline water which damages freshwater wetlands.

Well site construction activities include the construction of board roads and ring levees. Ring levees are approximately 4-acre impoundments constructed around a well site. The area of wetlands impounded by ring levees during the past decade is probably extensive.

Although no specific information is available at this time, the disposal or leakage of saline water into wetlands may have significant local impact near well sites.

Limited research has been conducted in Louisiana on the effects of hydrocarbon extraction on surface subsidence. A recent study in Louisian indicates that there is a correlation between anomalous subsidence and drilling operations (Trahan, 1984, Personal communication). In Texas and other coastal oil and gas producing regions where the problem has been more extensively studied (California and Venezuela), oil companies are required to address the issue of subsidence in their development plans and take appropriate corrective measures (Boesch et al., 1983).

(ii) Channelization, Dredging, and Mississippi River River Flood Control Measures

The establishment of intercoastal waterways, irrigation and drainage canals, and access channels has resulted in extensive channelization and attendant disposal of dredge spoil throughout the coastal zone. Cuts have been made on land and in bays, estuaries, and tidal flats. Major environmental consequences of channelization and disposal of spoil in banks and pipelines are: (a) alteration or modification of on-land drainage patterns; (b) tendency to dam wetlands and shallow wter bodies into isolated compartments, inhibiting natural circulation and altering temperature and salinity gradients; and (c) creation of unstabilized, easily eroded sediments that are reworked and redistributed by storms, normal waves, currents, and stream runoff.

Alterations in the hydrology of the Mississippi River basin have caused declines in sedimentation rates and have contributed to marsh deterioration in the coastal wetlands of Louisiana in recent decades. Coastal marshes appear to expand or diminish in areal extent according to the amount of sediment available, and sedimentation is the limiting factor controlling marsh growth. It is a natural system; overbank flooding is a major mechanism of introducing sediment-laden waters into adjoining wetlands. Therefore, flood control levees on the lower Mississippi River and its distributaries have resulted in wetlands loss because levees eliminate overbank flooding and prevent the distribution of alluvial sediments across the delta.

Sediment deprivation is also the result of a decrease in the sediment load of the Mississippi River as a result of river bank stabilization projects and upstream reservoir regulations. Land use changes, such as scientific soil conservation and reforestation programs within the basin, may also have contributed to the decrease in suspended sediment load of the river.

(iii) Filling and land reclamation

Artificial filling of shallow coastal water bodies and low-lying marshes creates valuable shorefront development land or additional land for industrial expansion. The process also permanently destroys parts of vital natural environments, alters shoreline configurations, modifies natural patterns of circulation and sediment dispersal, and commonly creates unstabilized and easily erodable substrates.

(iv) Shoreline construction

Construction of groins, piers, and jetties, as well as channel widening and deepening and dredge disposal, have modified th circulation and sediment availability and transport patterns along the Gulf coastline and within the bays and estuaries. The erosion and accretion of a shoreline is largely controlled by natural processes, of which sediment supply and wave energy are key factors. Shoreline construction, whether in the form of shoreline control or development, can affect the natural processes and the rate at which they work.

(v) Population growth

This is considered a major impact producing factor because it increases the demand for, and use of, community services and facilities (both public and private) such as education, police and fire protection, water supply and treatment, sewage treatment, solid waste disposal, water supply, recreation, transportation, health care, utilities, and housing. Such increases could couse reductions in the quality of a service and other adverse effects (e.g., fewer, less frequent services; crowding or congestion of facilties; shortages in supply; reductions in service standards). Population growth is also associated with the expansion of residential and commercial, public and semi-public land use and the related potential conflicts and impacts on existing environmental resources.

(vi) Waste disposal

A significant activity in the coastal zone is the disposal of waste, particularly in the more populated and industrialized areas. Although many wastes are treated and discharged into water bodies and other are incinerated, a large volume of wastes are disposed of beneath or on land. Land disposal of wastes may result in pollution of groundwater aquifiers or surface water bodies in the event the host soils are permeable and the groundwater table is high.

(d) Natural events and Processes

(i) Natural catastrophes

Several kinds of major natural processes create particular problems in the coastal zone. These include: hurricanes, which, through high and intense flood surges, may breach barrier islands and dunes, flooding low-lying coastal areas; shoreline erosion under normal and storm conditions; inland flooding along floodplains; and surface faulting and land subsidence.

(ii) Natural oil and gas seepage

Historical and contemporary data indicate that hydrocarbon seepage has been, and is, occurring in the Gulf of Mexico and elsewhere in the petroleum provinces of the world. It has proven difficult to pinpoint oil seeps in the deeper water areas of the Gulf, although many areas having anomalous concentrations of hydrocarbons in the water column are recorded on subbottom profiler records. They have also been detected and analyzed with chemical "sniffers." Some of these seeps occur at a considerable distance from commercial production.

(iii) Submergence of coastal wetlands

The submergence of coastal wetlands in the Gulf of Mexico region contributes to a loss of 50 square miles of land per year in coastal Louisiana. Recent studies indicate that the submergence rate in Louisiana is 1.2 cm per year. the submergence rate at which wetlands deteriorate is variable depending on local sedimentation rates. The submergence rate critical for the stability of Louisiana marshes has not been determined. The major natural factors contributing to this submergence are: (a) a eustatic rise in sea level and (b) coastal subsidence. An additional discussion of these factors is provided in Appendix D of Final EIS 94/98/102.

During this century, the rate of rise of sea level has increased to 12 cm per century (Gagliano et al., 1981) and, therefore, may account for 10% of the observed submergence in Louisiana. It is not known whether this modern acceleration in the rate of rise of sea level is a short-term deviation from a slower long-term rate or whether it is a continuing process associated with global climatic warming trend.

Approximately 90% of the submergence of coastal wetlands in Louisiana is the result of subsidence of the land (DeLaune et al., 1983). The primary processes responsible for land subsidence are geosynclinal downwarping; compaction, dewatering, and flow of recent sediments; and fluid withdrawal (hydrocarbons and water). It is not possible to quantify the contribution that each of these processes makes to the observed subsidence in coastal Louisiana.

(3) Physical Environment

(a) Water quality

(i) Impact factors

Potential impact factors expected to degrade area water quality will include the resuspension of bottom sediments through support activities and pipeline construction; effluent and operational discharges, including formation and produced waters, spent drilling fluids, cuttings, and sanitary/domestic wastes; and accidental hydrocarbon discharges resulting from spills and blowouts.

(ii) Direct and Indirect Effects

The direct effects would consist of increased water column turbidities resulting from routine offshore and onshore support activities, and including the discharge of spent muds, cuttings, and other effluents into marine and coastal waters. Other effects would include the increase of water quality parameters above normal background levels near the point of discharge. These parameters may include temperature, salinity, organic content, dissolved oxygen, and trace metals.

The indirect effects would include the temporary clogging of the respiratory and feedings mechanisms of benthic and pelagic organisms within the areas of operations and the potential for organisms to bio-accumulate trace metals, hydrocarbons, and other toxic constituents which are found in many of the discharged effluents.

(iii) Offshore

Impact Analysis: In the Western Gulf, the addition of some 713 exploration/ delineation wells, 912 development/production wells, 76 platforms, and up to 840 miles of pipelines are estimated for this area. Under this scenario, the discharge of an estimated 0.004-0.39 billion bbls of formation waters, 7.4 million bbls of drilling muds, 0.83 million cu. yds˙ of drill cuttings, 218,500 bbls of sand from drilling operations, and an average of 5,500 gallons/platform/day of treated sanitary domestic wastes from platforms may be expected as a result of the proposed action. Pipeline-relate activities would result in the disturbance of up to 504 million cu. yds˙ of sediment under the same scenario. Two oil spills greater than or equal to 1,000 bbls are estimated for the Western Gulf as a result of OCS production. Petroleum hydrocarbons introduced into the marine and coastal waters as a result of this spill may have varied effects on the local biota with impacts ranging from negligible to very high, depending on the resource impacted, the stage of weathering, and the local physical and meteorological parameters.

Immediate effects would be brought on by increased drilling, construction, and pipelaying activities, causing an increase in water column turbidities of the affected waters. Such increases would have a nominal impact on the productivity of phytoplankton, but may cause a temporary clog in the respiratory and feeding mechanisms of numerous benthic and pelagic marine organisms within the area of construction. Pipeline construction activities may also result in the resuspension of settled pollutants, toxic heavy metals, and pesticides.

The discharge of treated sanitary wastes from the various rigs and platforms will increase levels of suspended solids, nutrients, chlorine, and BOD in a small area near the point of discharge. However, as a result of treatment prior to discharge these constituents are quickly diluted.

During the course of exploration drilling and workover phases resulting from the proposed action, the discharge of drilling fluids, cuttings, and sand will degrade the quality of the waters surrounding the proposed new platforms. Concern has been expressed regarding the effects of drilling muds and cutting discharges on the marine environment. Based on the findings of NAS (1983), Symposium (1980), Neff (1981), Petrazzuolo (1981), Menzie (1982), and others, their results suggest that the environmental risk of exploratory drilling discharges to most OCS marine communities are small. Although dilution is extremely rapid in offshore waters to the extent that every substance measured in the water column, including turbidity, is at background by a distance of 1,000-2,000 m, uncertainties regarding effects still exist for low energy depositional environments which experience large inputs of drilling discharges over long periods of time.

Produced water is by far the largest quantity of waste to be discharged during normal oil and gas operations resulting from the proposed action. The majority of these waters will be discharged directly to the surface waters surrounding the individual platforms; however, in more sensitive areas and in some instances they may be piped ashore and treated for further disposal below ground, on land, or into coastal waters. The effects of produced waters on marine flora and fauna have been examined in laboratory bioassays and several case studies of existing production fields. Concern has been expressed regarding the individual synergistic and antagonistic effects of the various constituents of these waters, but the separation of components effects has not been possible in either case studies or bioassays. The published literature indicates that produced waters and brine are only slightly toxic (1%-10%) to practically nontoxic to most marine organisms, using those standards commonly cited for describing acute toxicity (Rose, 1981). The sublethal effects of produced waters have also been examined during laboratory and field investigations and generally suggest that detrimental effects would not occur at concentrations of produced waters which could be reasonably expected near the offshore discharge rates (Arctic Laboratories Limited et al., 1983).

In contrast to the lack of laboratory bioassay data, the effects of produced water have been examined in several case studies of offshore production areas; the most detailed of these have been completed in the Gulf of Mexico. Of those conducted within the Gulf, the only significant effects on biota to be documented occurred when produced waters were discharged into shallow bays and estuaries.

Concentrations of trace metals in produced waters typically exceed those concentrations found in seawater by an order of magnitude or more. In a review of environmental aspects of produced waters, Koons et al. (1977) cite an increasing body of evidence which indicates that natural processes reduce the activity and toxicities of trace metals dissolved in seawater as a result of binding with organic substances. The low toxicity of trace metals is substantiated by bioassay studies which indicate that most marine organisms tolerate relatively high concentrations of produced waters. However, bioaccumulation of metals and subsequent sublethal effects remain areas of potential environmental concern. The existing data, however, neither confirms nor denies the potential for bioaccumulation of trace metals.

Marine flora and fauna may be affected by several other components and properties of produced waters, including its high salinity, temperature, content of organic compounds, and low DO content; however, all investigators have agreed that rapid dilution and turbulence at the discharge point limit the zone affected by these properties (e.g., Mackin, 1973; Gallaway, 1980; and Bender et al., 1979). Although the distance required prior to the background levels being reached will vary with volume of produced water discharged and its particular characteristics, several investigators suggest that these levels are reached within a few meters from the discharge point, even in relatively shallow waters.

Offshore water quality degradation will occur within the immediate vicinity of exploration and production sites with high impacts expected to occur within a few meters to tens of meters from the discharge source. These impacts, however, will decrease to very low with distance (500-1,000 m) from the source.

CONCLUSION: The overall impact to offshore water quality is estimated to be low.

CUMULATIVE IMPACTS: Increased oil/gas exploration and development activities in the Western Gulf will contribute to the cumulative impacts on offshore water quality in this region. These activities, along with ocean dumping and increased vessel traffic, are among the contributors to areawide offshore water quality degradation.

Approximately 55 mobile rigs and 256 platforms (multiwell) currently operate in the Central Gulf Federal OCS. The addition of some 1,933 exploration/delineation wells, 1,602 development/production wells, 146 platforms, and 1,730 miles of pipelines are estimated for this area as a result of Federal OCS activity related to the proposed action and prior OCS sales. This could result in the discharge of up to 0.64 billion bbls of formation waters, 16 million bbls of drilling muds, 1.8 million cu. yds. of drill cuttings, and an average of 5,500 gallons/day/ platform of treated sanitary and domestic wastes. Pipeline-related activities could result in the disturbance of up to some 10.4 million cu. yds. of sediment.

Offshore waters will, therefore, be subject to cumulative impacts from discharges of drilling fluids, formation waters, and other effluents which add burdens of both toxic and nontoxic materials to the water column. However, the natural processes of dispersion, degradation, and sedimentation will result in immeasurably low concentrations of these materials within a few meters to a few kilometers of the discharge site, resulting in low cumulative impacts.

Other factors which may cumulatively impact offshore water quality in the Western Gulf consist of dredge material disposal, industrial waste dumping, ocean incineration, marine transportation, operational discharges, oil and hazardous waste spills, and radioacative waste dumping.

On the basis of volume, dredging is the largest single source of material that is ocean dumped. During 1979, more than 72 million cu. yds. of dredged material was deposited in the marine environment (U.S. Dept. of the Army, Corps of Engineers, 1980). Of that total, 68% was disposed of in the Gulf of Mexico. The total constituted nearly eight times the combined tonnage of industrial wastes, sewage sludge, construction debris, and other waste materials disposed of in the marine environment during 1979 (U.S. Dept. of the Army, Corps of Engineers, 1980). Open ocean disposal of dredged material taken from highly polluted areas and contaminated with harmful chemical constituents carries the threat of acute or chronic toxic effects on marine organisms and the potential contamination of human food resources.

When industrial wastes are ocean dumped, the waste materials are barged to a designated disposal site and discharged. Between 1973 and 1978, some 2.6 million tons of industrial wastes were dumped into the Gulf of Mexico; however, there has been a trend toward reduction of total ocean dumping of industrial wastes since 1973 when ocean dumping became regulated by the Federal Government, and industrial waste dumping has been totally eliminated in the Gulf of Mexico.

The first incineration at sea of chemical waste officially sanctioned in the U.S. occurred in the Gulf of Mexico between October 1974 and January 1975 when M/T Vulcanus incinerated 16,000 metric tons of organo-chlorine wastes at a designated site about 140 nautical miles southeast of Galveston, Texas (U.S. Environmental Protection Agency et al., 1980). In 1977, 17,600 tons of chemical waste were incinerated in the Gulf of Mexico. From studies of these early burns, it has been concluded that incineration at sea for organic chemical wastes does not cause unacceptable environmental consequences, at least on a limited basis for some chemicals and at these specific sites (U.S. Environmental Protection Agency et al., 1980). Although incineration at sea has been conducted on a limited basis, it is likely to become more common in the future.

Contaminants from marine transportation activities enter the sea intentionally as a result of routine operational discharges and unintentionally as a result of accidental spills. With respect to ships that maintain sizeable crews, the pollutants are the large amounts of domestic waste products such as sewage, food waste, and trash from the human activities on board. For recreational vessels, sewage disposal from marine sanitation devices in highly populated, confined harbors and anchorages is the primary pollution concern. Other problems are related to the movement of crude oil and concern offshore unloading terminals (deepwater ports) and identification of systems most reliable for transfer of oil from OCS production areas to shoreside facilities.

Perhaps the most publicized source of pollution is operational discharge of oil by tankers in the merchant marine fleet. Ballast seawater, contaminated with oil from the previous cargo or from tank washing, is sometimes intentionally discharged into the ocean. Regulation, coupled with the increased value of oil, has led to development of new and better techniques, such as segregated ballast, crude-oil washing systems, and oil/water separation systems for minimizing contamination of ballast water. Nevertheless, enforcement of regulations and standards is still a problem.

Substantial amounts of oil enter the marine environment as a result of accidental spills.

Hazardous materials have a wide variety of physical and chemical forms complicating and making difficult the response necessary for their cleanup and disposal.

Between 1946 and 1970, the Atomic Energy Commission (AEC) licensed the dumping of more than 86,000 containers of low-level radioactive wastes at 28 recorded dumpsites in the Atlantic and Pacific Oceans and the Gulf of Mexico. Of these, two dumps were made in the Gulf of Mexico U.S. Environmental Protection Agency, 1980). Ocean dumping was discontinued in June 1970 following a policy recommendation by the President's Council on Environmental Quality (CEQ) in its 1970 report to the President. Although not immediately contemplated, subseabed emplacement of high-level radioactive wastes is a future option.

CONCLUSION: The overall cumulative impacts can be expected to be very high.

(iv) Onshore

Impact Analysis: Onshore water quality degradation will occur as a result of increased nonpoint and point sources of pollution, especially in those areas of Texas (Sabine Pass to Lavaca Bay) where water quality problems already exist. Impacts to onshore water quality will occur as a result of runoff from construction and operation of onshore facilities supporting expanded OCS activities in this region. Nonpoint source impacts may be minimized by controlling erosional effects generated within construction site boundaries, with several of the adverse impacts being localized and prevented from having offsite impacts to water bodies in the vicinity of these activities. Any increase beyond normal background levels would be temporary and of a limited duration. Point source increases could also occur from effluent discharges related to OCS-support activities.

Produced waters, which are piped ashore from offshore production, are subject to treatment prior to discharge according to Federal and State regulations and permitting requirements. However, it should be noted that this treatment is only used in the extraction of oil and grease contaminants. These waters may, therefore, contain high concentrations of TDS, oxygen demanding wastes, toxic heavy metals, aromatic hydrocarbons, and environmentally high levels of radionuclides. In shallow semi-enclosed estuarine environments, impacts could be extremely high depending on the physical and biological components of each system. Although onshore water quality impacts are estimated to be low, effluents discharged in connection with OCS-support facilities, may be extremely damaging when released into sensitive habitats having a reduced capacity for pollution assimilation.

CONCLUSION: The overall impact to onshore water quality is estimated to be low.

CUMULATIVE IMPACTS: Increased oil/gas exploration and development activities in the Western Gulf will contribute to the cumulative impacts on onshore water quality in this region. These activities, along with current and future activities associated with State tidelands' oil and gas operations, industrial and municipal waste discharges, ocean dumping, and increased vessel traffic, are among the contributors to areawide water quality degradation.

Approximately 40 platforms (multiwell) are currently operating in the Western Gulf State waters (1985). An unknown number of additional structures may be constructed as a result of resource development in State-owned coastal waters. The construction of several additional pipelines from existing lease blocks in both Federal and State waters may occur in the future as a result of increased development activities in these areas. Pipeline-related activities resulting from prior OCS sales could result in the disturbance of some 10.4 million cu. yds. of sediment. Onshore water quality degradation will occur as a result of increased nonpoint and point sources of pollution associated with the construction and operation of this onshore support infrastructure.

Nearshore waters will, therefore, be subject to cumulative impacts from discharges of drilling fluids, formation waters, and other effluents which add burdens of both toxic and nontoxic materials to the water column.

Other factors which may cumulatively impact onshore water quality in the Western Gulf consist of industrial waste dumping, municipal waste discharges, urban runoff, accidental spills and chronic discharges, and nonpoint source pollution.

Industrial ocean outfalls are pipeline discharges of industrial wastes that directly enter estuaries, coastal waters, or oceans. Ocean outfalls of industrial wastes are regulated by USEPA through NPDES. In 1979, more than 5,000 NPDES permits were held for pipeline discharges by industries in coastal counties. In addition, about 7,500 operational discharges were associated with offshore oil and gas facilities. Pollutants that may be associated with various industrial effluents include synthetic organic compounds, heavy metals, oxygen-consuming materials, suspended solids, and nutrients.

Historically, the Nation's rivers, estuaries, and coastal waters have received municipal waste discharges since collection and treatment of domestic wastes was initiated. Prior to the 1970's, ocean disposal was largely unregulated, and adverse impacts on human health and the environment were observed. The principal hazards to human health from sewage waste disposal are associated with the transmission of human pathogens and the ingestion of seafoods contaminated with toxic metals and synthetic organic compounds.

Substantial amounts of oil and hazardous material enter the marine environment through far less spectacular means; spillage during loading and unloading operations in ports and harbors, pipeline leakage, equipment failures, spills from land vehicles, and storage facilities onshore are all sources and causes of accidental discharges. Oil contained in urban and river runoff (spent oil and grease that wash from the streets and sewers of cities) are major contributors to the oil content of the oceans. About 35% of the total annual oil pollution added to the seas is a result of accidental discharges from oil transportation (by tankers, pipelines, barges, etc.) (NAS, 1981). The remainder enters from coastal facilities and wastes, land runoff, natural seeps, and OCS activities.

The operation of some coastal facilities can result in large accidental spills or chronic unintentional discharges of harmful substances into coastal waters. For example, it is estimated that, on the average, each fueling of a pleasure craft at a recreational marina results in the spillage of one fluid ounce of gasoline or diesel fuel (Richardson et al., 1975). Oil and grease also enter the waters around a marina in bilge discharge and as a result of lubrication and maintenance. The effects of chronic discharges may become locally important in areas where coastal facilities occur at high densities, or when major portions of the coastal area are affected.

In contrast to the important progress made during the 1970's in controlling industrial point source discharges and in upgrading municipal sewage treatment facilities, progress with nonpoint sources is negligible (CEQ, 1980). Nonpoint source pollution is primarily the result of precipitation falling and moving over and through land and into surface water bodies. In some cases nonpoint source pollution is the result of human practices, for example, irrigation. All land use activities are potential nonpoint sources of pollution. Nonpoint sources of pollution are classified as urban and non-urban runoff. Nearly the entire United States is drained by river systems that eventually discharge into coastal waters. Depending on the pollutants and the characteristics of the river system they enter, various amounts of nonpoint source pollutants are ultimately discharged into coastal waters. Water pollution from nonpoint sources is estimated to affect about 90% of the drainage basins in the United States (U.S. Environmental Protection Agency, 1978). Pollution discharges from nonpoint sources greatly exceed the discharges from point sources.

Other factors considered to cumulatively impact nearshore and onshore waters include the discharge of dredge materials, industrial waste discharges, vessel discharges, and oil spills. These are discussed under the cumulative section for offshore water quality.

CONCLUSION: The overall cumulative impacts can be expected to be very high, primarily in those highly urbanized and industrialized coastal areas currently experiencing water quality problems.

(b) Impacts on air quality

(i) Impact factors

The major air quality impact producing factors from OCS-related operations are combustion, evaporation, or venting of hydrocarbons. These factors are the result of offshore and onshore OCS-related activities. Offshore activities may involve blowouts with or without fire, major oil spills, exploration and development drilling, platform installation, and oil or gas production. Onshore activities are oil refining and gas processing.

(ii) Direct and indirect effects

Direct effects on air quality are the result of catastrophic events and operational emissions. The unusual or catastrophic events, such as well blowouts with fire, gas well blowouts without fire, venting hydrogen sulfide laden (sour) gas, or major oil spills, is a potential occurrence. Air emissions from these events are of a short-term nonroutine nature; however, due to the sudden release of large quantities of hydrocarbons or hydrogen sulfide gas, immediate and direct effects may occur causing possible health hazard.

Operational emissions due to offshore activity typically emit relatively constant levels of criteria pollutants that may directly effect air quality. Typical emission levels are given in Tables IV.B.4.a-1, IV.B.4.a-2, and IV.B.4.a-3.

Indirect effects of OCS operations are concerned with onshore activities. These activities are primarily oil refining and gas processing.

Typical air emission experienced during peak year conditions, for a representative sale, are given in Table 4.B.4.A-3

(iii) Impact analysis

The ambient air quality in the Western Gulf is generally better than the national standards with those exceptions designated as nonattainment areas. Additionally, there are no PSD Class I areas in the Western Gulf. All nonattainment areas in the Western Gulf are identified in Section III.B.1.a.(8).

The proposal is expected to distribute offshore activity throughout the area. In the planning areas, the activity ranges to a maximum of 713 exploration and delineation wells, 912 development wells, and 76 platforms.

Of those coastal counties adjacent of offshore areas where the majority of development will occur, the ones most likely to be adversely impacted by this activity due to their unique status as nonattainment areas are

Table IV.B.4.a-1
Representative Emissions of Offshore Activity

Operational Emissions	Pollutant Emissions (tons/year)					
	VOC	NO_x	TSP	SO_x	CO	Notes
Exploration Drilling	18	180	13	12	40	Emissions valued from VCAPCD* assumes 60 days/well and 6 wells drilled near same site, i.e., constant drilling in same area over the full year.
Platform Installation	16	465	22	31	75	Emission values from ERG** assumes platform installation occurs over 9 months; includes support activities.
Development Drilling	9	240	11	21	71	Emission values from ERG** assumes 2 wells drilled at a time and 12 wells per year.

	Power Requirement
Oil Production	
Electrical Generation (oil pumping, platform electricity, miscellaneous)	5,300 hp-hr/10^3 bbls
Water Injection	3,000 hp-hr/10^3 bbls
Barge loading - 1.7 lb Hc per 10^3 gal transferred (crude oil)	
Gas Production and Processing	
Gas Compression (lift, gathering, sendout)	6,100 hp-hr/10^6 ft^3
Offshore Gas Processing (compression for heavy hydrocarbon removal, sweetening, dehydration)	3,200 hp-hr/10^6 ft^3

continued Table IV.B.4.a-1

Note: Emissions factors for power requirements are as follows (pounds/10^3 hp-hr):

NO_x	CO	HC	SO_x	TSP
2.9	1.1	0.2	0.004	NA

*Ventura County (California) City Pollution Control District.
**Energy Resources Group.

Source: Energy Resources Group (ERG), 1981.
ERCO, 1977.
U.S. Environmental Protection Agency, 1978b.
Ventura County (California) Air Pollution Control District (VCAPCD), 1981.

Table IV.B.4.a-2
Typical Emission for Exploratory Drilling Activity[1] in the Gulf of Mexico
(tons)

NO_x	CO	SO_x	VOC	TSP
10.3	1.51	0.69	0.34	Unknown

[1] Assumes: 10,000' hole; 597,120 hp/hr used; a 30-day period.

Source: U.S. Environmental Protection Agency, 1977.

Table IV.B.
Typical Emissions for a Major Platform in the Gulf of Mexico
(tons/year)

Equipment[1]	NO_x	CO	SO_x	VOC	TSP
3400 HP Turbine Generator	43	16	0.1	3.0	0.1
One Million BTU Heat Treater	2	0.2	0.1	0.1	0.1
600 HP Recip. Oil Pump	63	8.0	25	0.1	0.1
Total	108	24.2	25.2	3.2	0.3

(1) Assumed to be the most commonly used equipment based on current records compiled since June 1980 to the present.

Source: USDI, Minerals Management Service, Gulf of Mexico OCS Region.

Table IV.B.4.a-3

Air Emissions for Peak Year
(tons/year)

	NO_x	CO	SO_x	VOC	TSP	Wells and Major Platforms[1]
Proposed Action - M Scenario						
Exploratory Drilling	824.0	45.3	55.2	27.2	-	80
Production Drilling	309.0	45.3	20.7	10.2	-	30
Platforms	3,000.0	584.0	8.0	902.0	6.0	20[2]
Total	4,133.0	674.6	83.9	939.4	6.0	
Resources Expected to be Developed						
Exploratory Drilling	4,223.0	619.1	289.9	139.4	-	410
Production Drilling	3,090.0	453.0	207.0	102.0	-	30
Platforms	1,750.0	1,314.0	18.0	2,029.5	13.5	45[3]
Total	9,063.0	2,386.1	514.9	2,270.9	13.5	
Existing Platforms	210,000.0	40,880.0	560.0	63,140.0	420.0	1,400[3]
Cumulative Total	223,196.0	43,940.7	1,158.8	66,350.3	439.5	

(1) A major platform is one that has equipment capable of producing emissions.
(2) Assumes all platforms will be major.
(3) Assumes 50% of all platforms will be major.

Cameron, Nueces, Galveston, Harris, Jefferson, and Brazoria Counties, Texas.

The expected levels of offshore activities adjacent to the above counties are low. Due to the low level of expected activity near the coast resulting from this alternative, the impacts from operational emissions are also expected to be low.

Additionally, no significant degration of onshore air quality is expected onshore from routine offshore operations emissions.

CONCLUSION: Low impacts are expected in Cameron, Nueces, Galveston, Jefferson, and Brazoria Counties, Texas. Very low impacts are expected throughout the remainder of the coastal area of the Western Gulf.

CUMULATIVE IMPACTS: Presently, there are estimated to be 74 gas processing plants and 31 refineries in the coastal portion of the Western Gulf. In addition to existing gas processing plants, it is estimated that up to 2 new plants may be required as a result of prior leasing activities. No new oil refineries are projected for the Western Gulf.

Offshore infrastructure in the Western Gulf is estimated to be 615 platforms, 5,340 production wells and 3,082 exploratory wells as a result of leasing activity through 1982. Emissions from OCS installations is calculated at the time of permitting production facilities. Since records have been kept (June 1980), this air quality analysis has identified a negligible contribution.

Point source emissions from onshore activities, such as non-OCS oil and gas processing; power generation facilities; industrial processing or manufacturing facilities, waste incineration facilities, petrochemical storage facilities, and mobile emissions sources (automobiles, waterborne transportation, etc.) are expected to increase at rates in proportion to the growth of population. Energy conservation, improved automobile emission controls, alternative (non-fossil fuels) energy generation facilities, and new waste disposal technology are factors that will determine the rate of change in air quality. Ambient air quality is not expected to degrade beyond attainment standards where it is currently better than those standards or where PSD areas are located. The effects of all emissions on areas presently classified as nonattainment will be reduced over time so that attainment standards will be met. Controls or offsets may be applied to emission sources to meet these standards.

CONCLUSION: The overall cumulative impacts will be moderate.

(4) Biological Environment

(a) Impacts on Plankton

(i) Impact factors

The factors associated with oil and gas which may affect the plankton of the Western Gulf are oil spills, turbidity plumes resulting from drilling discharges and resuspension of bottom sediments during rig replacement, and pipeline burial.

(ii) Direct and indirect effects

Significant mortality would occur, in the event oil would contact to the phyto-and zooplankton populations. There may be a temporary and localized adverse effect on the phytoplankton and zooplankton due to turbidity plumes resulting from the temporary resuspension of bottom sediments during placement of offshore structures and the disposal of drilling muds and cuttings during the exploratory phase. The impacts on plankton would depend on the residence time for the organism within the plume. Primary productivity could be affected by reducing the photosynthetic assimilation of phytoplankton within the affected area. Zooplankton in the immediate vicinity of turbidity plumes may be adversely impacted by clogging the filter-feeding mechanisms or blocking respiratory surfaces.

(ii) Impact analysis

The proposal is expected to result in the drilling of over 1,600 wells and the emplacement of up to 76 platforms throughout the area. This would result in the dumping of over seven million barrels of drill muds, around 200,000 barrels of cuttings, and as much as 393 million barrels of formation waters. This will take place over a period of approximately 30 to 35 years. The extent of the waters into which this activity will take place will preclude all but localized and temporary impacts in the immediate vicinity of drill rigs and platforms.

The production phase can impact phytoplankton through the disposal of formation waters which contain the soluble fractions of crude oil at an average concentration of 30 mg/l and relict sea water with trace amounts of certain heavy metals. As mentioned above, the resultant receiving water concentration of petroleum hydrocarbons is difficult to assess, but if we assume instantaneous mixing into one cubic meter of sea water, the concentration would be approximately 30 micrograms per liter. Gordon and Prouse (1973) have observed stimulation of phytoplankton photosynthesis by Venezuelan crude in concentrations of 30 to 50 mg/l with inhibitions at higher concentrations in studies conducted off Nova.

The exploratory phase will have a localized effect on the phytoplankton in the vicinity of each exploratory well by the presence of turbidity plumes created by the diposal of drill muds associated with the cuttings. If we assume that these operations create a plume 20 m wide and 800 m long (plumes of this approximate maximum size have been observed in the Gulf of Mexico) then the euphotic zone will be reduced under 16 ha of sea surface for the duration of drilling (approximately 15 days). The residence time for any single phytoplankton within this reduced euphotic zone would depend on the vertical and horizontal transport to which it is subjected.
The activities associated with oil and gas leasing in the Western Gulf would be temporary and localized. Any adverse effects on plankton, resulting from the proposed action, would be localized, with populations expected to recover quickly.

CONCLUSION: The overall level of impact expected to plankton in the Western Gulf as a result of oil and gas leasing activities is very low.

CUMULATIVE IMPACTS: Gulf plankton populations are related to overall Gulf water quality. Planktonic populations may be affected by discharges from drilling operations, rivers and upland runoff, and shipping activities. Discharges which affect temperature, salinity, turbidity, nutrient, and chemical levels of the water would impact plankton. Due to the circulation and mixing patterns of the Gulf, impacts on plankton from such discharges would be localized. Localized impacts are expected to be short-term due to the short life span of plankton.

CONCLUSION: Cumulative impacts on plankton are expected to be very low.

(b) Impacts on benthos

(i) Impact factors

The potential impact factors which could affect the benthic environment, including the topographic features of the Western Gulf are oil spills; physical damage due to blowouts, drilling, platform and pipeline emplacement; and anchoring; and toxic effects on biota, resulting from the discharge of drilling muds and cuttings, produced waters, and other effluents.

(ii) Direct and indirect impacts

A surface oil spill is not expected to have a significant effect on the benthic environment of the Western Gulf because the deepest that oil is driven into the water column is 6 m. The oil would not reach the benthic environment in the Western Gulf. Oil released from the seafloor, through a blowout or pipeline rupture, could have a significant effect on the biota of topographic features. If the oil comes in contact with the biota of the topographic features, significant mortality would probably occur. This destruction of the biota could be long term or permanent.

The deposition of suspended sediments from blowouts or discharged drill muds and cuttings would affect the benthos. The sensitive benthic environment of topographic features could be smothered and suffer effects ranging from sublethal stress to mortality. Soft bottom substrates could be altered by the deposition of sediments. Should smothering of the benthic organisms occur, recolonization would occur fairly quickly; however, the species may differ. The sensitive biota of the topographic features could experience severe effects including mortality. Recolonization would be slow, and for some species perhaps would not occur.

Platform and pipeline emplacement, and anchoring causes effects on the benthos ranging from short-term alteration of the substrate to permanent and irreversible destruction of the environment. Structures placed on the soft bottom benthic environment would present a change in habitat which would attract different species. This effect would last for the duration of the structure emplacement. Structures (including anchoring) on the sensitive topographic features would cause serious long-lasting and even permanent destruction of the biotic communities of these features.

Toxicity due to drilling discharge is not expected to have a significant effect on the benthic environment. Most drilling muds are not toxic. Additives, including diesel, are the constituents which make the effluent toxic. The dilution and dispersion of the effluent upon discharge into offshore waters is sufficient to lessen the effects of toxicity with increased distance from the discharge point.

(iii) Impact analysis

The proposed action will result in a predicted 713 exploratory wells, 912 development wells, and 76 platforms. Based on this scenario, the discharge of an estimated 0.004-0.39 billion bbls of formation waters, 7.4 million bbls of drilling muds, and 0.83 million cu.yds.of drill cuttings may be expected to result from the proposed action. Pipeline related activities would result in the disturbance of up to 504 million cu. yds. of sediment.

Increased drilling, construction, and pipelaying activities, causing an increase in water column turbidities of the affected waters may cause a temporary clog in the respiratory and feeding mechanisms of numerous benthic organisms within the area of construction. Pipeline construction activities may also result in the resuspension of settled pollutants, toxic heavy metals, and pesticides if present.

During the course of exploration drilling and workover phases resulting from the proposed action, the discharge of drilling fluids, cuttings, and sand will degrade the quality of the waters surrounding the proposed new platforms. Based on the findings of NAS (1983), Symposium (1980), Neff (1981), Petrazzuolo (1981), menzie (1982), and others, their results suggest that the environmental risk of explortory drilling discharges to most OCS marine communities are small. Much of the toxicity of the mud aqueous faction of drilling fluids appears to be attributable to volatile organic components, which may include petroleum hydrocarbons and by-products of lignosulfonate and lignite, whereas suspended solids may cause mortality in sensitive species and juveniles by clogging and damaging gill epithelia. Benthic infauna tend to be affected to the greates extent by offshore drilling waste disposal, but most of the studies suggest that impacts are restricted to an area within 300-500 m of the discharge site.

The effects of drilling fluids and cuttings on benthic habitat, communities, and organisms may be physical (burial or substrate change) and chemical (toxicity). In practice, it is difficult to separate physical and chemical effects based on either field surveys or laboratory experiments. Most laboratory experiments on the effects of drilling fluids on benthic organisms have not been very successful in mimicking realistic exposure conditions. Effect on benthos have been observed in the field, under low to moderate energy regimes, within 1,000 meters of the discharge point. Only one study has yet described environmental changes over time after drilling operations ceased; while the fauna had been altered, recovery was nearly complete within 1 year. Because the effects of drilling discharges are probably largely physical, recovery time should be similar to those following other physical seabed disturbances. These times vary widely; recovery may take weeks in frequently disturbed shallow-water communities, several months to several years in continental shelf communities, and many years on the continental slope and in deep sea. The resuspensive transport of deposited drilling-fluid components may produce effects beyond the area of immediate burial, but at the same time it reduces the concentrations of potentially toxic substances. As the material disperses, organisms that feed at the sediment-water interface may nonetheless be exposed to higher concentrtions of such substances than bulk analysis of sediments would suggest.

Shunting drilling discharges to the near-bottom, as an alternative to surface disposal, may increase the exposure of benthic organisms to wastes. It may be effective, however, in restricting wastes from topographic rises with sensitive biota like reef corals. In contrast, surface discharges ensure dispersion and limit the duration and amount of organism exposure. Predilution of such discharges is generally unnecessary given the speed with which they are diluted, except possibly in low-energy or shallow-water environments.

The long-term benthic effects of drilling discharges from multiple wells during intensive exploration or development are difficult to distinguish from the effects of other discharges and activities (including oil and gas production) on the continental shelf and from natural variations. Results of platform monitoring studies have demonstrated spatially limited effects on the benthos. However, these effects cannot be directly ascribed to discharges of drilling fluids. Long-lived communities, which are characteristic of hard stustrate epibiota, may be particularly susceptible to long-term effects if they are exposed to large concentrations of deposited fluids and cuttings, but many of these communities are not very likely to accumulate such materials unless the materials are depositied directly on them.

In addition to toxic effects, the discharges, particularly the cuttings, form a low mound on the bottom beneath the discharge. Approximately 511-961 cu. yds of cuttings are disposed of during the drilling of an exploration well, depending on the depth of the well. Nonmotile plants and animals covered by this mound may be smothered, and to the extent that this mound exhibits different substrate characteristics (such as grain size, organic content, etc.) from the original bottom, the plants and animals which colonize the mound will be different. However, observations on such mounds show that they are colonized and reworked, and that after some period to time become indistinguishable from the surrounding bottom (Zingula, 1975). Furthermore, Menzie (1983) points out that it is the physical change of the substrate rather than any toxic effects which causes a change of benthic fauna around drilling rigs.

Produced water is by far the largest quantity of waste to be discharged during normal oil and gas operations resulting from the proposed action. The majority of these waters will be discharged directly to the surface waters surrounding the individual platforms; however, in more sensitive areas and in some instances, they may be piped ashore and treated for futher disposal below ground, on land, or into coastal waters. The effects of produced waters on marine flora and fauna have been examined in laboratory bioassays and several case studies of existing production fields. Of those studies conducted within the Gulf, the only significant affects on biota to be documented occurred when produced waters were discharged into shallow bays and estuaries. Mackin (1973) reported that produced water discharges totally destroyed the benthic community within 15 m of the discharges in a shallow (2.4 m) Texas estuary.

Leasing activity at topographic features has increased steadily during the past years. Assuming that only one of these events occur at a topographic feature, the impact to the biota would be severe and perhaps permanent.

Anchoring is inevitably associated with oil and gas activity. Supply boats, pipeline barges, and drilling rigs all may require anchoring. Topographic features are convenient anchoring spots due to their relief off the seafloor. Anchoring from oil and gas activities would cause severe damage to the biota of topographic features.

The probability of a subsurface oil spill occurring in proximity to a topographic feature is low. Effects to the benthos generally are not expected to be significant.

CONCLUSION: The level of impact to the benthos is expected to be low; however, in those areas having topographic highs, the impact would be very high.

CUMULATIVE IMPACTS: The major factors contributing to the impact of the benthic environment are anchoring, trawling, dredging, and ocean dumping. Bottom disturbance of soft bottom areas is frequent but usually short-term. Anchoring, trawling, and dredging cause disruption of the substrate and turbidity. Ocean disposal of dredged material smothers the benthos. These areas are usually recolonized quickly; however, often by different benthic species.

These same factors at hard bottom areas can be devastating. Destruction of the benthos is long-term at hard bottom areas. Significant impact has occurred at topographic features due to anchoring.

Oil and gas operations have been significant and are increasing around the topographic features of the Western Gulf. Past operations near topographic features have not had a significant effect on the benthic environment due to the implementation of protective lease stipulations.

CONCLUSION: The cumulative level of impact on the benthos is expected to be very high.

c. Impacts on fish resources

(i) Impact factors

The impact producing factors on fish resources are oil spills, operational discharges, and pipeline placement. Operational discharges include drill muds and cuttings, formation waters, and oil.

(ii) Direct and indirect effects

The direct effects of oil spills, operational discharges, and pipeline placement on fish resources are mortality and sublethal responses.

Indirect effects include habitat loss and loss of food species.

(iii) Impact analysis

Oil spills that contact the coastal marshes, bays, and estuaries have the greatest potential for damage to fishery resources. The majority of the Gulf's fishes are estuarine dependent. Potentially, oil spills could seriously impact fishery resources such as shrimp and many species of finfish that use these areas as nursery and/or spawning grounds, as well as sessile organisms such as oysters. Although adult finfish are usually able to avoid an offshore oil spill, large numbers of floating eggs, larvae, and juveniles could be destroyed.

According to Evans and Rice (1974), the impacts on fishery resources from oil pollution are: (1) killing organisms through coating and asphyxiation; (2) killing organisms through contact poisoning; (3) killing organisms through exposure to the water soluble toxic components of oil at some distance in time and space from the accident; (4) destroying the generally more sensitive juvenile organisms; (5) destroying sources of food and shelter; (6) incorporating sublethal amounts of oil and oil products into organisms (resulting in reduced resistance to infection and other stresses); (7) incorporating carcinogenic and potentially mutagenic chemicals into marine organisms; and (8) introducing low-level effects that may interrupt any of numerous behavioral stimuli (such as prey location, predator avoidance, mate location, other sexual stimuli, and homing behavior) necessary for the propagation of marine species and for the survival of those species higher in the marine food web.

Soluble aromatic hydrocarbons can be lethal to adult fishes in low concentrations (1-100 ppm) and to the more sensitive larval stages at even lower concentrations (0.1-1 ppm). Crustaceans appear to be the most sensitive (1-10 ppm) while fish and bivalves are moderately sensitive (10-100 ppm); however, lethal concentrations may be lower (0.1-1 ppm) for the more sensitive larval and juvenile forms. Studies citied by Evans and Rice (1974) show that certain fish eggs are extremely sensitive to the influence of oil products. For example, fertilized eggs of the plaice (Rhombus macoticus) were injured at concentrations of 0.01-0.1 ppm with 40%-100% of the hatched prelarvae showing some signs of degeneration during development and perishing (Nounou, 1980).

Two large spills (1,000 bbls or greater) are estimated for the Western Gulf of Mexico. A large spill contacting open bays containing finfish and shellfish nurseries and/or spawning grounds could cause severe, medium-term (1-3 years in duration) effects on fish resources. In addition, a number of smaller spill (less than 1,000 bbls) are assumed in this area. These spills could result in localized short-term effects on fish resources.

Fishery resources could also be adversely affected by; the discharge of drilling muds. Drilling muds, cuttings, and formation waters contain materials toxic to marine fishes; however, only at concentrations four or five orders of magnitude higher than those found more than a few meters from the discharge point. Further, dilution is extremely rapid in offshore waters to the extent that every substance measured in the water column is at background at a distance of 2,000 m (probably within 1,000 m) of the discharge point (Ecomar, Inc., 1980). The impacts of such discharges are limited in extent and confined to the benthic environment (NRC, 1983). The impact of operational discharges is expected to be low.

Approximately 840 miles of new pipelines are expected to result from the proposed action in the Western Gulf of Mexico. Pipeline placement activities would have localized impacts on fish resources including destruction of benthic species, fishery habitat, and increased turbidity. The impact of pipeline placement is expected to be low.

CONCLUSION: The level of expected impact on fish resources is estimated to be moderate.

CUMULATIVE IMPACTS: Cumulative impacts on fish resources include the impact of the proposed action, impacts related to prior OCS sales, and to major non-OCS impact producing factors.

Twenty-three large spills (1,000 bbls or greater) are assumed to occur in the Western Gulf of Mexico as a result of Federal OCS and other activities under the cumulative scenario. A large spill contacting open bay areas could result in severe, medium-term (1-3 years in duration) consequences on invertebrate and vertebrate fisheries and deter fishing.

In addition, a number of smaller spill (less than 1,000 bbls) are assumed in this area. These spill contacts could result in localized short-term effects on fish resources.

In addition to the 840 miles of pipelines projected for the Western Gulf of Mexico from the proposed action, another 890 miles are expected to result from lease sales held in the recent past. The impact of pipeline placement is expected to be low.

Fish resources in the Gulf of Mexico are also affected by activities and events other than the oil and gas industry. Fishing pressure exerted by commercial fishermen reduce standing populations of commercial species. Pollution and natural fluctuations in fish populations impact fish resources. Other impacts include loss of fish habitat, e.g., marsh and submerged aquatic vegetation.

CONCLUSION: The cumulative impacts may result in a high cumulative impact on fish resources.

(d) Impacts on marine mammals

Of the marine mammals discussed in Section III.B.1.b.(4)., the bottlenose dolphin is probably the non-endangered marine mammal more vulnerable to OCS-related oil/gas activities based on their population and nearshore habitat (Fritts and Reynolds, 1981; Schmidly, 1981).

(i) Impact factors

The major impact factors which could affect marine mammals include: OCS-related oil spills; collision with OCS-related support vessels; and disturbance from offshore activities.

(ii) Direct and indirect effects

The direct effects of oil on bottlenose dolphins could include damage to their eyes or skin tissue. Dolphins have been observed swimming and feeding near oil slicks and oil apparently does not adhere to their smooth skin (Geraci and St. Aubin, 1985). It is unlikely that dolphins would inhale oil into their blowhole while breathing; however, they could inhale toxic hydrocarbon vapors. Some oil-contaminated food or water could be ingested; the effects of oil ingestion by marine mammals is unknown.

Marine mammals could be struck by OCS-related support vessels resulting in injury or death. The incidence of vessel collisions with marine mammals is unknown; no injuries or mortalities have been reported or documented in the Gulf of Mexico region.

Noise from OCS-related activities such as air and vessel traffic, seismic activities, and noise from drilling and production platforms could disturb marine mammals. This noise disturbance could cause temporary displacement reactions, interfere with social communication between animals, and interfere with feeding.

Indirectly, oil spills could contaminate or destroy food sources, and noise disturbances could adversely affect food sources.

(iii) Impact analysis

Two large oil spills (1,000 bbls or greater) and several smaller spills within the estern Gulf are assumed for this analysis. The probability of a spill occurring is high (about 70%). Recent studies by Geraci and St. Aubin (1985) have indicated dolphins can detect and will avoid oil slicks and surface contact with oil did not affect their skin. The effects of vapor inhalation and ingestion of food contaminated with oil has not been determined. It is estimated that the level of impact to marine mammals from oil spills would be low.

As a result of the proposed action, vessel traffic is estimated to increase about 2%. The level of impact to marine mammals from OCS-related vessel collisions is estimated to be very low.

About 1,625 wells will be drilled, and some seismic exploration will be required over the assumed 20-30 year period of the proposed action. The effect of this disturbance to marine mammals is unknown; however, because it is usually short-term and fairly localized, it is unlikely to cause a major impact on marine mammals.

CONCLUSION: The level of expected impact on marine mammals as a result of the proposed action is estimated to be low.

CUMULATIVE IMPACTS: In addition to the impacts discussed previously for the proposed action, impacts from existing Federal OCS oil/gas leases and activities; existing oil/gas leases and activities in Texas tidelands; tankering of petroleum products and foreign crude oil; and other commercial, military, and recreational offshore and nearshore activities should be considered as cumulative impacts. Other activities could contribute to a cumulative impact on marine mammals include: sound produced by commercial, military, and recreational vessels and aircraft and by commercial and military sonar; natural oil seeps, bilge cleaning, and foreign oil spills, commercial and subsistence hunting of marine mammals; entrapment, injury, and mortality in fishing gear and underwater cables; and ocean disposal of chemicals, radioactive wastes, and munitions.

Twenty-three large spills (1,000 bbls or greater) and several smaller spills within the area could occur in the cumulative. Deepwater oil/gas exploration and development on the continental slope could affect sperm whales which feed on squid in deepwater areas. The cumulative impact of these factors on the marine mammal population is estimated to be moderate.

OCS-related vessel traffic is about 5% of the existing commercial, military, and recreational vessel traffic in the offshore areas inhabited by marine mammals. About 259,000 vessel trips of all types were recorded for the area in 1981. Seismic exploration will occur on additional lease blocks, and sound will be generated by 615 offshore platforms and numerous supply/crew boats and aircraft. The majority of these disturbances and noises are generally localized around the source and fairly short-term in duration. The cumulative impact from these disturbances and noises on marine mammals is estimated to be low in the Western Gulf.

CONCLUSION: As a result of the proposed action and other activities, the overall cumulative impact on marine mammals is estimated to be low.

(e) Impacts on coastal and marine birds

(i) Impact factors

The major impact factors which could affect coastal and marine birds include: OCS-related oil spills, displacement of birds from feeding and nesting areas by air vessel traffic, and disturbance from onshore facility construction near coastal nesting areas.

(ii) Direct and indirect effects

The direct effect of oil spills on birds include: death from hypothermia, shock, or drowning; oil ingestion significantly reduces reproduction in some birds; and oil contamination of eggs by oil-fouled adult birds reduces hatchability. Indirect effects of oil pollution on birds include contamination, displacement, and reduction of food sources. Long-term contamination of food sources and habitats may cause chronic toxicity to birds through the accumulation of hydrocarbon residues and may affect their behavior, physiology, and reproduction.

(iii) Impact analysis

Two large spills (1,000 bbls or greater) and several smaller spills are assumed for this analysis. Many of the coastal and marine birds which are susceptible to oil spills, are migratory and could be exposed to oil spills during their overwintering period (October-March).

Aerial surveys along the Texas coast during the Ixtoc I oil spill in 1979 found that the reduction in bird population during the period of oil impact was due to the birds' abandonment of polluted beaches rather than to bird mortality, since the population returned to normal levels soon after a tropical storm removed most of the oil from the beaches (USDC, NOAA, 1982). During the Ixtoc I spill, Chapman (1979) observed royal terns sitting along the high tide line on Texas beaches that were heavily oiled. It is estimated that the level of impact to coastal and marine birds from OCS-related oil spills would be moderate.

Disturbance of coastal and marine birds' nesting and feeding habitat from onshore construction and associated noise from air and vessel traffic could result in a reduction or elimination of birds that use the habitat for feeding or nesting. Dredging, emplacement of pipelines, and the construction of roads could change water flows that may result in damage or destruction of wetland nesting areas.

Affects to coastal and marine bird habitats may result from construction of an estimated 2-5 pipelines and 1-3 support bases in the Western Gulf coastal area. The estimated pipeline landfalls and support facilities will probably be located in developed onshore areas, and it is unlikely that they will affect coastal and marine nesting/feeding habitat. It is estimated that the level of impact to coastal and marine birds from OCS-related air and vessel traffic and onshore construction would be low.

CONCLUSION: The level of expected impact on coastal and marine birds as a result of the proposed action is estimated to be moderate.

CUMULATIVE IMPACTS: In addition to the impacts discussed previously for the proposed action, other impacts would result from existing Federal OCS oil/gas leases and activities, and existing oil/gas leases and activities in State tidelands. Impacts which are not related to OCS activities but could contribute to the major cumulative impact on coastal and marine birds would include the loss of nesting and feeding habitat to commercial, military, recreational, and residential construction; potential construction of offshore oil ports or deepwater marine terminals; dredging and draining of wetland areas along migratory flyways and in coastal feeding and overwintering areas; high levels of oil/tar balls from natural seeps, municipal runoff, bilge cleaning, and foreign crude oil spills; entanglement in commercial and recreational fishing gear; collision with electric lines and towers (Avery et al., 1980); and coastal storms and hurricanes which cause flooding and destruction of nesting areas resulting in bird losses. Agricultural runoff and industrial organic chemicals wastes could cause direct mortality or indirectly cause the loss of food sources for bird species.

Twenty-three oil spills (1,000 bbls or greater) and a number of smaller spills are assumed for this analysis. The expected level of cumulative impact on coastal and marine birds due to these oil spills is estimated to be moderate.

Disturbance from OCS-related aircraft, boat, and vessel traffic in the vicinity of bird nesting and feeding areas is not expected to increase above current levels. About 90% of the aircraft and vessel traffic in this area is non-OCS-related.

Cumulative impacts from OCS-related onshore development and support facilities are not expected to increase much above current levels. Up to five new pipelines, up to two gas processing plants, up to eight service bases, and three other shore facilities may be required.

CONCLUSION: As a result of the proposed action and other activities described above, the overall cumulative impact on coastal and marine birds in the Western Gulf is expected to be high.

(f) Impacts on endangered and threatened species

Endangered species consultation pertaining to post Gulf of Mexico OCS oil/gas lease sales have been held with FWS and NMFS. The biological opinions from these agencies (DOI, MMS, 1985) indicate that leasing and exploration activities associated with the proposed action were not likely to jeopardize the continued existence of the species considered in the consultation or result in the destruction or adverse modification of their critical habitat.

Of the endangered and threatened species discussed in Sections III.B.3 and III.B.1.b.(6)., loggerhead and Kemp's ridley turtles, and brown pelicans are probably the species most vulnerable to OCS-related impacts resulting from the proposed action. The endangered whale species which occur in the Gulf are not likely to be affected by OCS oil and gas activities because they are seldom sighted in areas where OCS-related oil/gas activities occur, and they are very few in number (Fritts et al., 1983). In addition, the most recent biological opinion from NMFs, dated January 1985, states that the potential exists for endangered whales to be harmed by a large spill in their immediate vicinity. this could reslt from the intake of oil through their blow hole, fouling their baleen plates, or their ingestion of oil contaminated food. However, since endangered cetaceans are uncommon in the leasing area, it is unlikely that they would be affected.

(i) Sea turtles

Impact factors: The major impact producing factors which could potentially affect sea turtles include OCS-related oil spills, collision with OCS-related support vessels, and OCS-related pipeline construction across turtle nesting beaches.

Direct and Indirect Effects: The direct effects of an oil spill contacting a turtle nesting beach during egg incubation or hatching periods (June-September) could cause significant mortality (Fritts and McGhee, 1981). Offshore oil spills could have a serious impact on sea turtles, especially juveniles. Floating oil could increase the mortality by contacting the turtles when they surface to breathe and indirectly by affecting food sources.

Collisions with OCS-related vessels could cause injury or death of sea turtles. Pipeline emplacement across a nesting beach during June-September could disrupt nesting and destroy nests.

About 100 miles (about 25% of the exposed coastline) of the south Texas coastline is suitable habitat for sea turtle nesting. Sporadic (primarily loggerhead and Kemp's ridley) nesting occurs in this area.

Impact Analysis: Two large oil spills (1,000 bbls or greater) and several smaller spills are estimated. The probability of a spill occurring is high (about 70%). Only a moderate portion of the sea turtle nesting beaches in south Texas are exposed to potential oil spills, and these beaches experience only light nesting; therefore, it is unlikely that OCS-related oil splls will affect nesting. However, recent studies have indicated that sea turtles can be severely affected by floating oil/tar balls. It is estimated that the level of impact to sea turtles from oil spills would be moderate.

As a result of the proposed action, OCS-related vessel traffic is estimated to increase about 2%. The incidence of vessel collisions with sea turtles is unknown; however, as no injuries or mortalities have been reported or documented, it is estimated the level of impact to sea turtles from OCS-related vessel collisions is very low.

Up to five oil/gas pipeline landfalls are estimated. Up to two of these pipelines could cross sea turtle nesting beaches. If these pipelines are emplaced during June-September (sea turtle nesting period), severe mortality of eggs or juvenile turtles could occur. If pipeline emplacement occurs other than during nesting season, the potential impacts would be negligible.

CONCLUSION: The level of expected impact on sea turtles as a result of the proposed action is estimated to be moderate.

CUMULATIVE IMPACTS: In addition to the impacts discussed previously for the proposed action, impacts from existing Federal OCS oil/gas leases and activities; existing oil/gas leases and activities in State tidelands; tankering of petroleum products and foreign crude oil; and other commercial, military, and recreational offshore and coastal activities should be considered as cumulative impacts.

Impacts that are unrelated to OCS activities but contribute to major cumulative impact on sea turtles include: the loss of nesting beaches to commercial, recreational, and residential development along Texas beaches; high mortality caused by commercial trawling; natural and man-induced predation of turtles and eggs on nesting beaches throughout the Gulf and Caribbean regions; oil/tar balls from natural seeps, bilge cleaning, and tanker spills; compaction of beach areas by vehicles and beach cleaning equipment; incidental capture by commercial longline fishing gear and entanglement in crab pot lines; dumping of contaminated wastes and plastic materials into coastal waters; and collision with commercial and recreational vessels.

Twenty-three large spills (1,000 bbls or greater) and several smaller spills could occur in the cumulative. An unknown number of oil spills could result from oil development in the Texas tidelands. Also, oil/tar balls from natural seeps, bilge cleaning, and foreign oil spills contact the Texas coastal area. The cumulative impact of oil spill contacts and other oil contamination is expected to result in a high level of impact on marine turtles.

Collisions of OCS-related support vessels with sea turtles could occur in Texas coastal areas; the incidence of collisions has not been documented and is believed to be infrequent.

Impacts to sea turtles from OCS-related coastal development and support facilities are not expected as the majority of these facilities are already established. Up to five new pipeline landfalls, up to two gas processing facilities, and up to eight service bases may be required; these are unlikely to affect sea turtle nesting/feeding areas. The cumulative impact of OCS-related facilities are expected to result in a low level of impact on marine turtles.

CONCLUSION: As a result of the proposed action and other activities, the overall cumulative impact on sea turtles in the Western Gulf is estimated to be high.

(ii) Brown Pelicans

Impact factors: The major impact factors which could affect brown pelicans include OCS-related oil spills, disturbance from air, vessel traffic, and onshore facility construction.

Direct and indirect effects: Brown pelicans (and other coastal bird species) are vulnerable to oil spills because their feathers can become contaminated with oil as they plunge-dive to feed or alight on the water's surface to rest. This may contribute to direct mortality of adult birds. Indirect effects can occur if an oiled bird contaminates eggs, which can cause mortality of the embryo. Oil spills could also reduce food sources for brown pelicans and other coastal bird species.

Brown pelicans and other coastal bird species are susceptible to disturbance caused by air and vessel traffic and human intrusion. Habitat alteration resulting from onshore construction could result in nest desertion, egg losses, and juvenile mortality.

Impact analysis: There are about 4 nesting colonies of endangered brown pelicans along the Texas coast. The major breeding population nests at Pelican Island in Corpus Christi Bay; other colonies nest at Deadman's Reef north of Rockport, Long Reef in Aransas Bay, and Caroll Island in San Antonio Bay. The Texas population of brown pelicans is about 400-500 birds.

Two large oil spills (1,000 bbls or greater) and several smaller spills and estimated for the cumulative. A small portion of the south Texas coastal area is utilized by brown pelicans for nesting, and a larger nearshore area is used for feeding. It is estimated that the level of impact to brown pelicans from oil spills would be moderate.

As a result of the proposed action, OCS-related air and vessel traffic is estimated to increase about 2% between onshore support bases and offshore platforms. This increased noise disturbance is estimated to have a low level of impact on brown pelican nesting areas.

Coastal onshore facility construction of 2-5 pipeline landfalls and up to 3 onshore support bases are not likely to be constructed near brown pelican nesting areas. It is estimated that the level of impact to brown pelicans from onshore construction would be low.

CONCLUSION: The level of expected impact on brown pelicans in the Western Gulf coastal areas, as a result of the proposed action, is estimated to be moderate.

CUMULATIVE IMPACTS: In addition to the impacts discussed previously for the proposed action, impacts from existing Federal OCS oil/gas leases and activities; existing oil/gas leases and activities in State tidelands; tankering of petroleum products and foreign crude oil; and other commercial, military, and recreational coastal activities should be considered as cumulative impacts.

Impacts that are unrelated to OCS activities but contribute to the major cumulative impact on brown pelicans would include the loss of habitat to commercial, military, recreations, and residential development in the coastal zone; dredging and drainage of wetland and coastal feeding areas; high levels of oil and organic chemical contamination of coastal water and food sources by agricultural runoff and industrial wastes; the disturbance from aircraft, boat, and vessel traffic in nesting and feeding areas; entanglement in commercial and recreational fishing gear; collision with power lines and towers (Avery et al., 1980); and coastal storms and hurricanes which cause flooding and destruction of nesting areas.

Twenty-three large oil spills (1,000 bbls or greater) and several smaller spills are assumed for this analysis. In addition, oil/tar balls from natural seps, bilge cleaning, and foreign oil spills could also affect brown pelicans. The expected cumulative impact of oil spills and other oil contamination on brown pelicans is estimated to be high.

Disturbance from aircraft, boat, and vessel traffic in the vicinity of pelican nesting areas near Corpus Christi, Texas, and feeding areas along the Texas coast is not likely to increase above current levels as a result of OCS oil/gas activities. About 90% of the aircraft, boat, and vessel traffic in this area is non-OCS-related, such as: commercial tanker/cargo vessels; commercial and recreation fishermen; intracoastal tug and barge traffic; maintenance dredging; and commercial and private aircraft.

Impacts to brown pelicans from OCS-related onshore development and support facilities are not expected to increase much above current levels to handle cumulative OCS oil/gas resources. A few additional pipelines and gas processing facilities and service bases may be required; however, the majority of OCS-related onshore facilities are already established.

CONCLUSION: As a result of the proposed action and other activities, the overall cumulative impact on brown pelicans in the Western Gulf is expected to be high.

(g) Impacts on seagrasses and wetlands

(i) Seagrasses

Impact factors: Factors associated with offshore oil and gas activities which may affect coastal seagrasses include oil spills, pipeline emplacement, navigation canals, and maintenance dredging.

Direct and indirect effects: The direct effects of an oil spill contacting seagrass areas may result in extensive and relatively long-term damage. The level of impact would depend on the amount, toxicity, and degree of weathering of the oil; seagrass species; weather at the spill site; water depth, tidal conditions, and suspended sediment load of the water; previous exposure to oil; and cleanup method used.

The direct effects of pipeline emplacement, navigation canals, and maintenance dredging on seagrass areas may result in temporary short-term or extensive long-term damage. The recovery of seagrasses from pipeline emplacement or dredging varies from complete to nonrecovery depending on several factors, including the degree of displacement, location, substrate, seagrass species, wave action, season, and light availability.

The indirect effects of damage or destruction of seagrass areas result in a loss of habitat and food source for many marine organisms. Many commercially important crustaceans and fishes use seagrass beds for shelter and feed on the organisms on the seagrass and detritus. The loss of seagrass areas could result in accelerated coastal erosion as seagrasses help stabilize the bottom substrate and moderate wave action.

Impact analysis: Seagrasses occur primarily in tidal areas along the coastline, around barrier islands, and in estuarine areas. Seagrass ecosystems are usually less vulnerable to oil spills due to their generally subtidal nature. Numerous studies have indicated that the most vulnerable of all marine communities appear to be intertidal communities (Zieman et al., 1984).

Chan (1977) observed no direct change to turtle grass (Thalassia), eel grass (Syrigodium), and shoal grass (Halodule) from an estimated 1,500-3,000 bbls of crude oil and water emulsion tanker spill. The spill drifted ashore along a 50-km section of the Florida Keys from Boca Chica to Little Pines Keys.

There are about 257,818 acres of unexposed and 1,596 acres of exposed seagrass areas in the Western Gulf of Mexico coastal area. The seagrass areas exposed to potential oil spills (about 0.6% of the total) are primarily in the Galveston County, Texas, coastal area.

Two large oil spills (1,000 bbls or greater) and several smaller spills are expected to occur. Since only a small portion of the seagrass areas would be exposed to potential offshore oil spills, it is estimated that the level of impact to seagrasses from oil spills would be low.
Up to five oil/gas pipeline landfalls, no new navigation channels, and a undetermined amount of maintenance dredging of existing navigation channels are estimated. For this analysis the assumption is made that the emplacement of one mile of pipeline or one mile of canal dredging could damage or destroy up to six acres of seagrasses. It is estimated that up to 90 acres of seagrasses could be damaged or destroyed in the vicinity of the pipeline landfalls and maintenance dredging. This represents a loss of up to 0.03% of the total seagrasses. This would indicate a low level of impact to seagrasses.

CONCLUSION: The level of expected impact on coastal seagrasses as a result of the proposed action is estimated to be low.

CUMULATIVE IMPACTS: In addition to the impacts described for the proposed action, impacts from existing Federal OCS oil/gas leases and activities in State tidelands; barging and tankering of foreign crude oil and petroleum products; channelization and maintenance dredging; commercial and recreational trawling; commercial, military, and recreational boat and vessel traffic; agricultural, industrial, and municipal effluents; and coastal storms and hurricanes all impact coastal seagrass beds to some extent. Few of these impact producing factors can be quantified.

Oil spills which contact seagrasses in intertidal areas can result in extensive and long-term (1-3 years) damage. However, as most seagrass areas are subtidal, oil spills usually only contact and damage those areas which are exposed to tidal influences.

A total of 23 large oil spills (1,000 bbls or greater) and several smaller spills are assumed for this analysis. The probability of a spill occurring is very high (about 99+%). There is a potential for some of these oil spills to occur nearshore or inshore from barges, tankers, or pipelines, which could cause extensive damage to intertidal seagrasses in the vicinity of the spill site.

Only a limited portion of the seagrass areas in the Western Gulf coastal area would be exposed to potential oil spills. It is estimated that the cumulative level of impact to seagrasses from oil spills would be moderate.

Most of the dredging for pipeline and navigational canals in coastal waters of, where seagrasses occur, damage or destroy some seagrasses. The extent of damage depends on several factors, such as, location, substrate, seagrass species, wave action, etc. Maintenance dredging of inlets and navigational canals is an ongoing process in the coastal area. Where pipeline canals and navigational channels intersect the coastline, barrier islands, or estuarine areas, there are usually seagrass areas that could be damaged.

Up to 17 new pipeline landfalls, up to 21 new onshore facilities, 1 new navigation channel, and an undetermined amount of maintenance dredging of existing navigation channels are estimated. It is estimated that up to 300 acres of seagrasses could be damaged or destroyed in the vicinity of the pipeline landfalls and this dredging activity. This represents a loss of up to 0.01% of the total seagrasses. This would indicate a low cumulative level of impact to seagrasses.

Although other construction activities in the coastal area may not directly impact seagrasses, there may be an indirect impact of sedimentation and increased effluents of organic chemicals which may damage or destroy seagrasses in the coastal area. Trawling, vessel traffic, and coastal storms cause wave action, water turbulence, and turbidity which can damage seagrasses. The cumulative impact of these activities on seagrasses in the WCA is estimated to be moderate.

CONCLUSION: The overall cumulative level on impact on seagrasses is estimated to be moderate.

(ii) Wetlands

Impact factors: The major impact producing factors which could potentially affect coastal wetlands are: oil spills, pipeline emplacement, navigational channels, and maintenance dredging.

Direct and indirect effects: The direct effects of an oil spill coming into contact with wetlands could cause extensive and relatively long-term damage. Important variables determining the degree and impact include the amount and toxicity of the crude, the degree of weathering the crude has undergone prior to contacting a wetland, wetland type contaminated by the crude, the climate and weather of the spill site, the water depth and suspended sediment load, the cleanup method attempted, and previous exposure to oil spills.

The direct effects of pipeline emplacement, onshore facility construction, and maintenance dredging on wetlands may result in temporary short-term or extensive long-term damage. The recovery of coastal wetlands from pipeline emplacement varies from complete to nonrecovery depending on many factors, including degree of disturbance, location, substrate, species, season, and hydrologic factors. The push ditch method of pipeline installation is preferred by most pipeline permit applicants. This method involves excavation of a trench, placement of the pipe in the trench, and placement of excavated soil back into the trench. In other cases, depending on substrate, salinity, and hydrology, the wetland vegetation becomes reestablished naturally. In some situations, restoration is stipulated by the regulatory agencies. In some cases, the wetlands erode and are lost.

Indirect effects of damage or destruction of wetland areas result in the loss of habitat and food sources for many marine and coastal organisms. Many commercially important crustaceans and fishes depend on estuarine wetlands for shelter, food, and nursery areas. Several endangered and threatened species, coastal birds, and waterfowl utilize wetland habitats. The loss of wetlands could result in accelerated coastal erosion as they trap sediments and assist in stabilizing the coastal areas from erosion.

Indirect impacts of channelization affecting wetlands loss include hydrologic interruptions and saltwater intrusion. Scaife et al. (1983) indicate that hydrologic interruptions created by spoil banks are a primary factor affecting wetlands loss. Intersecting spoil banks partition areas of marsh and impede drainage. Poor drainage is deleterious to plant survival (Mendelsohn et al., 1981), and as vegetation in impounded areas dies, ponds appear.

Canals act as conduits for the inland movement of comparatively saline water. Saltwater intrusion kills salt intolerant plants, thereby contributing to wetland deterioration. It is established that saltwater intrusion is damaging to freshwater wetlands, especially to "flotant marshes" which lack a firm subsoil and consist entirely of salt intolerant vegetation.

Impact analysis: Holt et al. (1978) reported the effects of a small (377 bbls) crude oil pipeline spill at Harbor Island near Aransas, Texas. The oil spilled into a cordgrass (Spartina) and black mangrove marsh. The long-term effects of the oil spill were minimal in most of the affected areas. Through the first growing season cordgrass growth was much reduced in areas with heavy concentrations of oil compared to more lightly affected areas. Results indicated that heavy oiling at the end of the growing season was manifested in the next growing season, and heavy oiling of cordgrass in any season is apparently lethal. The black mangrove appeared relatively tolerant to even heavy oiling.

Studies by O'Neil et al. (1983) indicate the effects of petroleum spills on marsh flora varies. Salt grass was reported killed by repeated application of crude oil during a 5-month interval (Wilson and Hunt, 1975). Recovery time of cordgrass from a crude oil spill was estimated at 1-3 years (Krebs and Tanner, 1981).

There are about 875,245 acres of non-forested wetlands in the area. The wetlands exposed to potential oil spills consist of about 150 miles of coastal wetlands (about 28% of the coastal wetlands). For this analysis two large oil spills (1,000 bbls or greater) and several smaller spills are assumed to occur. As about one-third of the coastal wetlands are exposed to potential oil spills, it is estimated that the level of impact to wetlands from oil spills could be moderate.

Up to five oil/gas pipeline landfalls, 1-3 onshore facilities, no new navigation canals, and an undetermined amount of maintenance dredging of existing navigation channels are estimated.

For this analysis the assumption is made that onshore emplacement of one mile of pipeline or one mile of canal could damage or destroy up to 12 acres of coastal wetlands. Estimates of the average acreage used for new onshore infrastructure/support facilities considered in the analysis are as follows: exploratory drilling service base - 15 acres; development/production service base - 75 acres; pipeline installation service base - 5 acres; pipe coating yard - 150 acres; pipelines per mile - 12 acres; platform fabrication yard - 400 acres; gas processing plant - 75 acres; and marine terminal - 30 acres.

It is estimated that up to 300 acres of coastal wetlands could be damaged or destroyed as a result of the estimated pipeline emplacements, onshore facility construction, and maintenance dredging. This represents a loss of up to 0.03% of the total wetlands and would indicate a low level of impact to wetlands.

CONCLUSION: The level of expected impact on coastal wetlands as a result of the proposed action is estimated to be moderate.

CUMULATIVE IMPACTS: In addition to the impacts described for the proposed action, impacts from existing Federal OCS oil/gas leases and activities; existing oil/gas activities in State tidelands; barging and tankering of foreign crude oil and petroleum products; channelization and maintenance dredging; commercial, military, and recreational boat and vessel traffic; residential, urban, and industrial development; agricultural, industrial, and municipal effluents; and coastal storms and hurricanes all impact coastal wetlands to some extent. Few of these impact producing factors can be quantified. Submergence increases the depth, periodicity, and in some cases duration of given levels of salinity. Development replaces the coastal wetlands with upland habitats. Wave erosion replaces the non-forested emergent wetlands with open water.

A total of 23 large oil spills (1,000 bbls or greater) and several smaller spills are assumed for this analysis. The probability of a spill occurring is very high (about 99+%). There is a potential for some of these oil spills to occur nearshore or inshore from barges, tankers, or pipelines which could cause extensive damage to coastal wetlands in the vicinity of an oil spill site. Only a limited portion of the coastal wetlands would be exposed to a potential oil spill incident. It is estimated that the cumulative level of impact to coastal wetlands from oil spills would be moderate.

Most of the pipeline canal and navigational channel maintenance, dredging activities, and construction of onshore facilities in coastal areas where wetlands occur, damage or destroy some wetlands.

Five to ten new pipeline landfalls, one new navigation canal, up to five new onshore facilities, and a undetermined amount of maintenance dredging of existing navigation canals are estimated. It is estimated that up to 1,500 acres of coastal wetlands could be damaged or destroyed as a result of these activities. This represents a loss of up to 0.2% of the total wetlands and would indicate a moderate level of impact to wetlands.

Other construction and development activities in the coastal area may have direct and indirect impacts on wetlands. A direct loss of wetlands occurs by dredging and draining, thereby converting wetlands to uplands.

CONCLUSION: The overall cumulative level of impact to wetlands in the WCA is estimated to be high.

(h) Impacts to areas of special concern

(i) Impact factors

The potential impact factors which could affect the areas of special concern are oil spills; physical damage due to drilling, platform, and pipeline installation; blowouts and anchoring; and toxic effects on the biota, resulting from the discharge of drilling muds and cuttings, produced waters, and other effluents.

(ii) Direct and indirect impacts

The Flower Garden Banks and other topographic features are areas of special concern in the Western Gulf of Mexico. Effects resulting from the impact factors could be severe and long lasting.

(iii) Impact analysis

Potential causes of adverse impacts to the resources from this proposal are oil spills mechanical damage to organisms (and their habitat) due to drilling, anchors, pipeline and platform emplacement; smothering by drilling fluids or cuttings, and blowouts; and toxicity to organisms of drilling fluids components; and mechanical damage due to blowouts.

Two spills are expected from this proposal spill may occur from a seafloor source (pipeline accident, oil well blowout) or sea level source (tanker accidents, leaks on the platform, etc.). Oil may be transported downward to some extent in the water column due to normal circulation processes but should not be transported below the pycnocline under normal conditions. Oil spilled from a seafloor source or spilled at the surface under certain circumstances, such as severe storms, may be entrained and transported for great distances in subsurface currents. This was the case for the Ixtoc-1 spill, where some oil released into the water column at the seafloor circulated in the Gulf below the surface for months before reaching the Texas coast. Such oil at depth could come in contact with the biologically sensitive topographic features (banks) of the Western Gulf.

All the offshore resources of concern mentioned above would be at risk from drilling muds and cuttings discharges during drilling operations and to mechanical damage from construction activities. Impacts from these activities are generally quite localized in extent. However, the damage caused by these activities to unique and productive communities, such as coral reefs and live bottoms, would be quite severe.

Considerable mechanical damage could be inflicted upon the bottom by normal and routine oil and gas operations. The drilling operation itself disturbs some small areas. Anchors from support boats and ships, floating drilling units, and pipeline laying vessels can do a great deal of damage to live bottoms and corals. The area actually affected will depend on depth of water, length of chain, size of chain, wind, and current, but severe damage to sensitive communities can occur within the area. Pipeline emplacement also causes considerable disruption to the bottom. It is estimated that six acres of the bottom is physically disturbed per mile of pipeline laid; some 2,300-6,000 cu. yd. of sediment are resuspended per mile of pipeline, depending on the size of the pipeline and depth of trenching (burial). Add to this damage caused by the eight anchors of the pipelaying barge and it is clear that considerable damage will be done if such activities are conducted in sensitive coral or live bottom areas. In fact, anchor damage is considered the most serious threat to coral reefs and live bottom areas. Anchor damage includes crushing and breaking of coral heads, and anchors often destroy a wide swath of sessile organisms as the anchor is dragged and the chain moves around as the vessel swings at anchor.

Blowouts can present a serious threat (due to burying to resuspended sediments) to important biological resources if one were to occur near a coral or live bottom area. Gas well blowouts generally pose far less environmental risk than do oil spills, resulting only in very high concentrations of suspended sediments and increased levels of gas in the water column very near the source of the blowout. To the extent that oil or condensate is present in the reservoir, some liquid hydrocarbons may also be injected into the water column. The suspended sediments may be carried some distance by currents, but the bulk of the sediments are redeposited within a few thousand meters of the blowout site. Low-molecular-weight-hydrocarbons (gases) will dissolve in the water column until saturation is reached; both gaseous and dissolved low-molecular-weight hydrocarbons will be released into the atmosphere within a few days of a blowout without major biological effect. Liquid hydrocarbons will be diluted to background levels within a few thousand meters distance from the blowout site and will degrade with time.

One other source of discharges into the Gulf from routine oil and gas operations, which is sometimes cited as a potential hazard to biological communities, is produced water. This proposal would result in up to 393 million barrels of this discharge but of course only a small percent of this would be released near the banks. The preponderance of the evidence indicates that such discharges are not an environmental hazard (Neff, 1981; Petrazzuolo, 1981).

Impacts to the areas of special concern are expected to be significant. One occurrence at such an area would cause substantial destruction of the environment.

CONCLUSION: The level of impact to areas of special concern is expected to be very high.

CUMULATIVE IMPACTS: The cumulative impacts to areas of special concern are discussed in Section IV.B.4.a.(4)(b).

CONCLUSION: The cumulative level of impact to areas of special concern is expected to be very high.

(i) Impacts to marine sanctuaries

There are no designated marine sanctuaries in the Western Gulf of Mexico. The Flower Garden Banks are proposed as a National Marine Sanctuary and are covered as an area of special concern in Section IV.B.4.a.(4)(h). See also Section IV.B.4.a.(b). as a subarea containing the Flower Gowder Banks has been deferred from leasing in this 5-year program.

(5) Socioeconomic Environment

(a) Impacts on employment and demographic conditions

(i) Impact factors

Factors that impact employment and demographic conditions in the Gulf Coastal region are oil and gas exploration activities and production operations, including geophysical/seismography surveys, exploratory and development drilling, and well operation and maintenance. Contract field services, such as acidizing, cementing, mud service, well logging, perforations, etc., are also included. These activities are covered under the United States Government's Standard Industrial Classification (SIC) Code 13 - Oil and Gas Extraction.

Refining, oil field machinery and equipment manufacturing, pipeline transportation, gas production and distribution, and the wholesaling of petroleum and petroleum products covered under SIC Codes 29, 3533, 46, 492 and 517 also create job opportunities.

In addition, jobs are induced or supported by expenditures of workers in the industries mentioned above. Induced employment results from the demand for consumer goods and services such as food, clothing, housing, entertainment, etc. These items are sought by all workers and households within a region, regardless of occupation.

(ii) Direct and indirect effects

Direct employment effects include job opportunities generated by the proposed action in SIC Code 13 - Oil and Gas Extraction.

Indirect employment effects include job opportunities created by the proposed action in secondary oil- and gas-related industries covered under

SIC Codes 29, 3533, 46, 492, and 517, as well as jobs induced by expenditures of direct and secondary employees. This analysis implicitly assumes that the net increase in employment (new resident employment) created by the proposed action will go to employees currently outside the region. Instead, these opportunities may be used by workers currently in the coastal region who are unemployed, not in the labor force, or employed within non-oil and gas activity. These occurrences were not quantified due to lack of detailed base information.

Total new resident population is estimated as the number of employees who move into the region times 2.3, which is the 1982 population/employment ratio for the entire Gulf of Mexico coastal region. Payroll relative to new resident direct, secondary, and tertiary employment generated by the proposed action is estimated as new resident employment multiplied by the comparable average payroll per employee. The average payroll figures applied to direct and secondary employment are based on 1982 U.S. Department of Commerce payroll data for the applicable SIC categories included in the direct and secondary oil- and gas-related industries. The average payroll per employee for tertiary employment is based on the 1982 data for all SIC categories. The impacts on employment, payroll, and population will be measured by the anticipated influx of new employees and residents into the coastal region as a result of the proposed action.

Also, activity in each Federal OCS planning area will result in non-payroll expenditures on equipment requirements. A portion of these expenditures will benefit the economy of the coastal region to the extent that these equipment requirements are manufactured or supplied locally.

(iii) Impact analysis

This analysis is based on projections made both with and without the proposed Western Gulf sales. Employment projections with the proposed lease sales are based on the well drilling, platform, and pipeline requirements estimated for the proposed action. Employment projections without the sales assume no sales after 1986. These without sale projections are used for comparative analysis.

The scheduled Western Gulf of Mexico lease sales of the proposed 5-year schedule are expected to provide employment to Western and, to some extent, Central Gulf residents throughout the 1988-2016 period. Employment generated from these scheduled sales is expected to peak in 1996 at about 12,000 direct, secondary, and tertiary jobs. However, MMS analysis indicates that there will be no new residents to the Western and Central Gulf regions as a result of the proposed 5-year plan. Employment generated by the proposal will allow continuation of some existing oil/gas-related jobs which is estimated to peak in 1987 primarily due to Gulf of Mexico OCS areawide sales prior to 1986.

CONCLUSION: Because there is no new resident activity, the impact of the proposed 5-year schedule on all affected Gulf coastal subareas is expected to be very low.

CUMULATIVE IMPACTS: The cumulative impact analysis is based on the expectations of the proposed actions in the Gulf of Mexico, as well as the projected effects of past leasing and other existing employment producing activities (in all industries). Total population, employment, and income in the Central and Western Gulf coastal regions is addressed in Section III. These aggregate indicators of economic activity have been projected by MMS on the basis of growth trends for SMSA's and other substate regions prepared by USDC. These growth trends were derived for use in the published report, 1980 BEA Regional Projections, which was developed under the supervision of USDC's Bureau of Economic Analysis; this analysis was based on historical data through 1982. Total employment, income, and population in the coastal region based on this analysis is expected to grow throughout the next 10 years at an average rate of 1% annually in the Central Gulf and 2% annually in the Western Gulf, even without additional OCS oil and gas lease sales. The proposed actions will have a negligible effect on these total average annual growth rates since these sales are expected to result in much less than 1% growths in economic activity in each affected coastal subarea, as previously discussed in this report.

CONCLUSION: The cumulative effect will be an average annual growth rate of about 1% in the Central Gulf and 2% in the Western Gulf, which are considered low impact levels.

(b) Impacts on coastal land use

(i) Impact factors

Factors that may impact coastal land use conditions are concerned with oil and gas facility operations and/or construction. Facilities operated or constructed may include service bases supporting offshore exploration, development, production and pipeline transportation, pipe coating yards, marine terminals, platform fabrication yards, gas processing plants, refineries, pipeline landfalls, and onshore installation.

(ii) Direct and indirect effects

Direct effects on coastal land use include pipeline installation and new construction of facilities required to transport or support OCS oil and gas activities. Pipeline and support facility construction may directly affect coastal environments by the alteration of natural conditions such as loss of fish and wildlife habitats, increased erosion, hydrologic disruption, and land cutting and filling.

Indirect effects could result from induced expansion of oil and gas facilities and activities onshore due to the incremental share of hydrocarbon processing and refining caused by OCS production. The share of OCS production is determined by the amount of onshore production, the amount of domestic and foreign imports, and the level of OCS activity at a given time. The relative contribution to oil refining and gas processing made by the OCS changes almost daily.

(iii) Impact analysis

Onshore support and processing services for offshore drilling and production under the proposed action are estimated to be provided almost entirely from existing facilities in Louisiana, Mississippi, Alabama, and Texas. The Central and Western coastal areas have a highly developed system of onshore support and processing infrastructure serving oil and gas development in the OCS. Much of this infrastructure has unused or readily expandable capacity.

The only new facilities estimated under the proposed action are possibly 5 pipeline landfalls with up to 840 miles of onshore routing. Potential locations for the pipeline landfall include Matagorda, Brazoria, Galveston, Chambers, and Jefferson Counties in Texas.

Analysis of the activities/facilities estimated under the proposed action, Texas coastal management program, and local land use policies indicates that potential incompatibilities or conflicts can be avoided or effectively mitigated. Postsale proposals to use specific sites must go through necessary Federal, State, and local review and permitting procedures. Experience in the Gulf indicates that this regulatory framework can be sufficiently flexible to allow reconciliation of most site-specific problems which could emerge after a sale.

CONCLUSION: The analysis indicates that the expected level of impact on state and local land use will be very low.

CUMULATIVE IMPACTS: Cumulative impacts on State and local land use management include the impacts of the proposed action as discussed above, plus impacts related to prior OCS sales and to major non-OCS impact producing factors affecting the coastal area.

Estimated facilities construction resulting from prior OCS sales and the proposed action are as follows: 6 service bases; 3 pipe coating yards; 11 pipeline landfalls; 5 platform fabrication yards; and 8 gas processing plants.

Non-OCS factors include all those activities which can cause potentially major impacts to, or conflicts with, the policies, objectives, and regulatory requirements/guidelines of local land use plans and coastal zone management programs. Broadly stated, these activities include residential, commercial, industrial, agricultural, institutional, recreational, energy, and transportation facilities, and other development.

CONCLUSION: The expected level of impact on state and local land use would be low.

(c) Impacts on water supply

(i) Impact factors

Increased demands on water resources are expected to occur as a result of elevated OCS support operations and related employment and population increases. Large quantities of freshwater, largely nonpotable, may be transported offshore and used on platforms during drilling activities and for mixing various drilling muds. The addition of new gas processing plants to these areas could impact local water supplies. These plants incorporate a variety of cooling systems, some of which use large quantities of water. Other activities associated with OCS support which may impact the area's water supply include temporary support bases, permanent support bases, platform fabrication yards which produce 2-4 steel-fixed piling platforms per year, concrete platform yards, and petrochemical complexes.

The effects could range from a minor stress of local water supplies to regional water supplies being substantially affected and requiring facility construction, expansion, or a new source of water being sought out.

(ii) Impact analysis

Increased demands on coastal water resources in the Western Gulf may be expected to occur as a result of elevated OCS activities in this area. Changes in population and increased industrial activities may result in association with expanded OCS support activities resulting from the proposal. Based on MMS estimates for the Western Gulf, an estimated water consumption of approximately 1.7 billion gallons can be expected in association with offshore drilling activities alone. Supply bases could use as much as 5.2-8.2 million gallons of freshwater/rig-platform/day, with 460,000 gallons being potable. Additional water uses would come from onshore support activities associated with gas processing, refining, and platform fabrication. Projected peak new resident population growth associated with the proposed action is estimated to be minimal. No significant increases in local water usage will occur as a result of new population growth; therefore, very low impacts are estimated as a result of population increases associated with the proposed action. Low to moderate impacts of a localized nature could be experienced, particularly in areas currently experiencing water supply shortages, such as the Sabine Pass and Houston-Galveston areas, as a result of increased water usage by onshore support operations.

CONCLUSION: The proposed action is expected to have a low impact on regional water supplies in potentially affected locations in the Texas coastal area.

CUMULATIVE IMPACTS: As a result of prior OCS-related activities and the proposed action, the addition of up to 6 new service bases, up to 8 new gas processing plants, up to 5 platform fabrication yards, up to 146 platforms, up to 1,933 exploration/delineation wells, and up to 1,602 production wells will impact area water supplies as a result of prior OCS-related activities. These impacts to water supply will result in increased burdens on existing water resources. Mitigation of water supply-related impacts will require prudent site selection of these projected onshore support facilities in areas known to possess ample surface and groundwater supplies at present, and with water resource conservation and development plans for the future. OCS-generated new resident population in the Texas coastal area would be widely distributed over 14 counties and could account for increased demands for residential water usage ranging from less than 0.05% to as high as 7%. Overall, these OCS-generated cumulative demands are expected to have a low to moderate impact on the water supply of the potentially affected area.

A 1982 report by the Texas Department of Water Resources on "An Overview of Texas Water Resources Problems and Water Resource Issues" discusses current and future water resource problems in the State of Texas. This report shows conclusively the high cumulative impacts from population and non-OCS-related activities in the Western Gulf.

CONCLUSION: The overall cumulative impact is expected to be very high.

(d) Impacts on commercial fisheries

(i) Impact factors

The major impact producing factors on fishing activities from the proposed action would be production platforms, gear conflicts, and oil spills.

(ii) Direct and indirect effects

Direct effects include removal of trawling space, mortality of eggs, larvae, and juveniles, and losses such as trawls, shrimp catch, business downtime, and vessel damage. Production platforms remove from 3-5 acres of trawling space. Financial losses from gear conflicts are theoretically covered by the Fishermen's Contingency Fund.

Indirect effects are primarily economic. Secondary employment in businesses such as boat and equipment manufacturers, processing plants, and marinas would be affected by a decline in commercial fisheries.

(iii) Impact analysis

From 1977-1981 approximately 179.9 million lbs/yr of finfish and shellfish with a dockside value of $148.0 million were caught in the Western Gulf of Mexico. Seventy-six platforms are expected under this proposal eliminating less than 0.1% (228-380 acres) of the trawling area. A large spill contact could cause severe, medium-term (1-3 years duration) effects on fisheries. In addition, a number of smaller spills (less than 1,000 bbls) could occur. If any of these spills was to contact a shellfish nursery or spawning ground, localized short-term effects on fish resources could occur.

CONCLUSION: The level of expected impact on the commercial fishing industry is estimated to be moderate.

CUMULATIVE IMPACTS: Cumulative impacts on commercial fisheries include the impact of the proposed action, impacts related to prior OCS sales, and to major non-OCS impact producing factors.

In addition to the 76 platforms projected for the Western Gulf of Mexico from the proposed action, another 50 are expected to result from lease sales held in the recent past. The total area lost to trawling (378-630 acres) would still represent less than 0.1% of the trawling area.

Twenty-three large spills (1,000 bbls or greater) are assumed to occur in the Western Gulf of Mexico as a result of Federal OCS and other activities under the cumulative scenario. A large spill contacting open bay areas could result in severe medium-term (1-3 years in duration) consequences on invertebrate and vertebrate fisheries and deter fishing. In addition, a number of smaller spills (less than 1,000 bbls) are assumed. Should any contact open bay areas, those contacts are expected to result in localized short-term effects on fish resources.

Commercial fisheries in the Gulf of Mexico are also affected by activities and events other than the oil and gas industry. Competition between large numbers of commercial fishermen, commercial operations employing different fishing methods, and commercial and recreational fishermen for a given fishery resource may reduce standing populations. Also, fishing techniques which may take significant numbers of other species as "by catch," such as trawling or gill netting, may reduce the standing populations of these as well as the desired species. In the Western Gulf, populations of red snapper and other reef fish appear to be declining, particularly nearshore, primarily due to fishing pressure from hook-and-line fishermen. Overfishing and taking of juveniles, as "by catch" in trawling operations, are also affecting red drum populations in Texas. Space use conflicts can also result from different forms of commercial operations and between commercial and recreational fisheries. Trawling and crabbing operations often lead to this type of conflict resulting in loss of fishing space or gear conflicts. Also, the loss of wetlands is being closely studied to determine in what way and to what extent this loss affects commercial fisheries.

CONCLUSION: The impacts resulting from the proposed action, plus the effects of these other factors, added to the widely varying baseline conditions resulting from natural environmental factors, may result in a high cumulative impact on the commercial fishing industry.

(e) Impacts on recreation and tourism

(i) Impact factors

Factors associated with offshore oil and gas development which may impact recreation and tourism include oil spills, trash and debris, offshore structures, pipelines, and support services. Support services would include helicopter and vessel traffic and coastal infrastructure developments (service bases, refineries, and processing plants).

(ii) Direct and indirect effects

Direct effects on recreation and tourism include offshore structure development which will attract fish and inevitably fishing and some SCUBA diving. Study reports by Ditton and Graefe (1978), Ditton and Auyong (1984), and Roberts and Thompson (1983) have demonstrated the popularity and importance of production platforms to offshore recreational activity and associated coastal economic implications. Drilling rigs and platforms will also affect an unobstructed ocean view when operating in nearshore waters off major beach and resort areas. Pipelines which come ashore across recreation lands will temporarily remove the construction area from recreational use. Oil spills and trash and debris from offshore operations can come ashore on recreational and tourist beaches affecting the quality of recreational experiences and can temporarily remove beach, park, and recreation lands from visitor use. Noise and wave action associated with helicopter and boat traffic servicing offshore oil and gas fields can intermittently affect the ambience of some recreational and tourist areas.

Indirectly, coastal infrastructure development and economic inducements associated with offshore oil and gas development can lead to increased congestion in coastal communities, recreational areas, and boat harbors, and an increase in cost and a temporary reduction in the availability of recreational services.

(iii) Impact analysis

Continued OCS leasing in the area over the next five years under the proposed alternative will result in an additional installation of an estimated 76 new offshore platforms through the year 2005. These platforms and the exploratory drilling rigs will be at least 10 miles from shore and coastal shorefront recreational and tourist centers like Padre Island National Seashore and Galveston Island. Those platforms and drilling rigs operating within 10-15 miles of shore will be barely visible from shore during clear weather conditions and will impose very limited distraction from the background viewshed of coastal recreation shorefronts. Those production platforms installed within 25 miles of major population centers and resort communities (Galveston, Port Aransas, and Brownsville) are likely to become popular fishing locations.

Pipeline landfalls resulting from additional tracts leased over the 5-year period are expected to temporarily and locally impact the use of recreation and tourist lands directly associated with pipeline construction sites. As pipelines are planned developments associated with OCS product transmission needs, it is highly unlikely projected landfalls would reduce the level or quality of recreation or tourist activity anywhere. Should oil spills from exploration, production, or transmission facilities come ashore along a major Texas shorefront, localized and short-term impacts on recreation and tourism activity are likely to occur. Should the oil spill incident(s) impact popular beach and resort areas during the peak use season, the impact to the affected area and its use will be more serious. Based on expected oil discoveries up to two major spills can be expected. Trash and debris from offshore operations will continue to affect beach aesthetics and maintenance programs throughout the shorefront recreational and resort areas of Texas, especially at Padre Island National Seashore which includes the Gulf's natural dumping area at the point of major longshore converging currents.

CONCLUSION: Continued OCS leasing for the next five years under the proposed alternative is expected to result in a low impact on recreation and tourism.

CUMULATIVE IMPACTS: Cumulative impacts will result from the combined action of former and future leasing on the OCS, State oil and gas leasing, and other activities contributing to the gravity of the impacting factors likely to affect recreation and tourism in the Gulf of Mexico region. The number of oil and gas production platforms is expected to increase to over 600 structures off Texas through the year 2000. Many of these will become popular fishing resources and are likely to encourage additional offshore recreational fishing. Although new structures visible from shore are likely to be installed, other nearshore structures that have been producing for many years will likely be removed. The marginal change on seashore viewsheds will be negligible.

The level of crude oil developed and imported within the Gulf of Mexico is unlikely to decline, oil spills can be expected to come ashore on one or more major shorefront recreational beaches. Partial closure of impacted recreation areas can be expected to accommodate containment and cleanup activity. Recreation and tourism impacts will be localized with little or no regional implications. Indirect impacts are unlikely to change from current levels which have had no detectable adverse effect on the level of recreation and tourism activity.

The level of trash and debris originating from the Gulf is expected to increase with time and increased commercial, industrial, and recreational activity in the Gulf of Mexico.

Shorefront park, beach, and recreational areas will be continuously affected with an increasing trash load affecting major Texas beaches between the Sabine River and Port Mansfield. Cost of beach maintenance and administrative programs will increase, beach aesthetics will decline, but the overall level of recreation and tourism activity is unlikely to change.

CONCLUSION: Planned development and accidents associated with continued development and use of the Gulf of Mexico, including the additional leasing projected under the proposed alternative, is expected to have a low impact on recreation and tourism.

(f) Impacts on archaeological resources

(i) Historic

Impact factors: Any surface (land) or bottom (ocean) disturbing activity has the potential of destroying valuable archaeological data. These impact producing factors include the placement of drilling rigs, platforms, pipelines, and anchors offshore, and the construction of onshore support facilities. Oil spills may also destroy valuable archaeological data.

Direct and indirect effects: Direct physical contact between a drilling rig, platform, pipeline, or anchors and an historic shipwreck may destroy fragile ship remains such as the hull and wooden or ceramic artifacts, and disturb the site. Direct physical contact between onshore support facilities and an historic site could cause physical damage to, or complete destruction of, historic sites, structures, and artifacts, and could disturb the integrity of the site. Should an oil spill contact a coastal historic site such as forts and lighthouses, the sites and surrounding environment would be contaminated with oil.

Impact analysis: Since information contained in historical sites is often unrecorded in written historical accounts, physical alteration or destruction of complete sites, or site components may result in the loss of information on our nation's maritime and cultural heritage. Contamination of coastal historic sites by an oil spill would cause a temporary and reversible impact on the asthetics of the site, but no loss of historical information.

The percent acreage leased that could be disturbed by projected development in archaeological Zone 1 (where the potential for shipwreck occurrence is assessed as being high) is up to 13.5%. Therefore, although there is the potential for a loss of significant historic archaeological data should a direct interacting occur between an impact producing factor and an historic shipwreck, the potential for such an interaction occurring is assessed as being moderate.

There could be a maximum of up to 1300 acres disturbed by onshore development. Due to the relatively low amount of acreage projected for disturbance, the visibility of most onshore historic sites, and State and Federal cultural resource laws which require consideration of historic properties if any State or Federal funding or permits are required for construction, the expected impact to coastal historic sites as a result of the projected onshore development associated with the proposed action is very low.

Two large spills (1,000 bbls or greater) and several smaller oil spills are assumed for this analysis. Should one or more of these spill contact a coastal historic site such as fort or lighthouse, the major impact would be visual due to oil contamination of the site and its environment. This impact would probably be temporary and reversible with no actual loss of information.

CONCLUSION: The impact of the proposal on historic sites will be low.

CUMULATIVE IMPACTS: Other major factors which would affect significant historic archaeological resources in the Western Gulf include trawling, sport diving/commercial treasure hunting, hurricanes, channel dredging, previous oil and gas development, and chronic, low level hydrocarbon contamination.

Of these factors, commercial treasure hunting, hurricanes, channel dredging, and cumulative levels of oil and gas development are assessed as having a high potential for causing loss of significant historic archaeological data (see Section IV.D.2.a.(11) of Final EIS 104/105).

The most intensive areas of trawling in the Gulf are represented by the centers of abundance for white shrimp. Extensive trawling within these areas would probably only affect the upper 3 inches or so of sediment (NERBC, 1980). Any shipwreck site components within 3 inches of the present seabed probably would be affected should the area be trawled. On many wrecks, this zone would already be disturbed by natural factors and would contain only artifacts of low specific gravity which have lost all original context and have been heavily abraded (Muckelroy, 1978). Therefore, the effect of trawling on most historic shipwreck sites would probably be very low.

Sport diving and commercial treasure hunting are a significant factor in the loss of historic data from wreck sites. While commercial treasure hunters generally impact wrecks with intrinsic monetary value, sport divers may collect souvenirs from all types of wrecks. The impact from these activities cannot be quantified.

Shipwrecks in shallow waters are exposed to a greatly intensified longshore current during tropical storms (Clausen and Arnold, 1975). Under such conditions, it is highly likely that artifacts of low specific grav-ities (e.g., ceramics and glass) would be dispersed, leaving only the denser materials (iron, steel, ballast, and conglomerates) at the original site. Some of the original information contained in the site would be lost in this process, but a significant amount of information would also remain. Overall, a signif-icant loss of data from historic sites has probably occurred, and will continue to occur, in the Central Gulf from the effects of tropical storms. Assuming that some of the data lost has been unique, this impact would be very high.

Because most channel dredging occurs at entrances to bays, harbors and ports, there is a high probability for impacts to historic sites because of high site densities in these areas. Assuming that some of the data lost have been unique, the impact to historic sites as a result of past channel dredging activities, would be very high.

Although no estimate as to the potential loss can be made, due to the magnitude of previous oil and gas activity, it is assumed that the impact from the loss of unique archaeological data in the Gulf has been very high.

It has been estimated that the annual input of petroleum into the Gulf from all sources approaches 2.3 million bbls. This chronic hydrocarbon contamination could have an impact on historic resources. However, since the impacts to historic sites from oil contamination are generally short-term and reversible, the expected cumulative imapcts from oil contamination are estimated to be low.

CONCLUSION: The cumulative impact to the historic archaeological resources base in the Western Gulf from impact producing factors is assessed as being very high.

(ii) Prehistoric

Impact factors: Refer to Section IV.B.4.a.(5)(f) under Historic.

Direct and indirect effects: Direct physical contact between a drilling rig, platform, pipeline, anchors, onshore support facilities, or beach clean-up operations, and a prehistoric site may destroy fragile artifacts or site features and disturb the context of the sites. Should an oil spill contact a coastal prehistoric site, the potential for dating the site using Carbon-14 would be destroyed. However, if diagnostic artifacts are present in the site, loss of C-14 dating potential may not constitute a loss of unique information.

Previously unrecorded coastal sites may suffer direct physical impact from beach cleanup operations. Interaction of cleanup equipment with a site could destroy fragile artifacts or site features and could disturb the site context.

Impact analysis: Any *in situ* prehistoric site located on the Gulf of Mexico OCS would be completely unique. As sites are discovered, those along relict shorelines, seaward of about the 20 m isobath, will provide unique archaeological data on coastal adaptations prior to the Late Archaic period. Such information is unavailable from terrestrial sites in North America because coastal areas for all cultural periods prior to the Late Archaic are currently submerged on our continental shelves. Archaeological data on prehistoric migrations, settlement patterns, and cultural contacts across now submerged land masses is also information which can only be obtained from submerged sites on the OCS.

Physical alteration or destruction of complete sites or site components may result in the loss of archaeological data on prehistoric migrations, settlement patterns, subsistence strategies, and cultural contacts for North America, Central America, South America, and the Caribbean.

The percent acreage leased that could be disturbed by projected development in archaeological Zones 1 and 2 (where the potential for prehistoric site occurrence is assessed as being high) is as high as 13.5%. Therefore, although there is the potential for a loss of significant prehistoric archaeological data should a direct interacting occur between an impact producing factor and an inundated prehistoric site, the potential for such an interaction occurring is assessed as being moderate.

There could be a maximum of up to 1,300 acres disturbed by onshore development. Due to the relatively low amount of acreage projected for disturbance and State and Federal cultural resource laws which require consideration of cultural resources if any State or Federal funding or permits are required for construction, the expected impact to coastal prehistoric sites in the WPA as a result of the projected onshore development associated with the proposed action is very low.

Two large spills (1,000 bbls or greater) and several smaller oil spills are assumed for this analysis. Should one or more of these spill contacts be with a coastal prehistoric site, the potential for dating the site using Carbon-14 would be destroyed. However, if diagnostic artifacts are present in the site, loss of C-14 dating potential may constitute a loss of unique information.

CONCLUSION: Impacts to prehistoric sites will be low.

The loss of C-14 dating potential of a site as the result of oil spill contamination probably would not destroy unique information; therefore, this impact also would be low.

CUMULATIVE IMPACTS: Other major factors which would affect significant prehistoric archaeological resources in the Western Gulf include trawling, hurricanes, channel dredging, previous oil and gas development, and chronic, low level hydrocarbon contamination.

Of these factors, hurricanes, channel dredging, cumulative levels of oil and gas development, and chronic, low-level hydrocarbon contamination are assessed as having a high potential for causing loss of significant prehistoric archaeological data (see Section IV.D.2.a.(11) of Final EIS 104/105).

The most intensive areas of trawling in the Western Gulf are represented by the centers of abundance for brown shrimp. It is probable that the impact on significant prehistoric archaeological resources in the Western Gulf due to trawling would be very low.

About one-third of the coast along the Western Gulf was hit with 16-20 tropical cyclones between the years 1901-1955 (DeWald, 1980). The other two-thirds had a slightly lower incidence of cyclones (11-15). Five major hurricanes also cut the Western Gulf between the years 1954-1977. It is probable that the impact on significant prehistoric archaeological resources in the Western Gulf from tropical storms would be very high.

Because most channel dredging occurs at entrances to bays, harbors, and ports, there is a high probability for impacts to prehistoric sites because of high site densities in these areas. Assuming that some of the data lost have been unique, the impact to prehistoric sites, as a result of past channel dredging activities, would be very high.

Chronic hydrocarbon contamination could have an impact on prehistoric resources. The impact of chronic hydrocarbon contamination in the Western Gulf in the loss of significant prehistoric site data may be very high.

CONCLUSION: The cumulative impact to the prehistoric archaeological resources base in the Western Gulf from impact producing factors is assessed as being very high.

(g) Impacts on marine transportation and ports

(i) Impact factors

Factors that may impact marine transportation are increased vessel traffic and the emplacement of fixed structures. The impacts on ports are related to the demand for additional port and harbor space, which generally involves temporary and permanent service loses and facilities necessary for the shipment of platform and pipeline materials. The Central and Western coastal areas contain a well-established ports and waterways system involved in offshore oil and gas support.

(ii) Direct and indirect effects

Most of the impacts on ports and marine transportation will take place during the development phase of oil and gas operations resulting from the proposed action. Vessels traveling between the coast and offshore sites, during normal supply and work crew transport, will result in an increase in ship traffic in the area's harbors, traffic lanes, and the offshore region. These service boats, barges, and drilling and mud ships may travel outside the customary traffic patterns of open water shipping. Such increases in oil- and gas-related vessel traffic and their patterns of movement will increase the probability of conflicts. Slow-moving vessels engaged in pipe laying activities will also operate in a manner inconsistent with normal activities.

Pipeline construction operation involve a lay barge, 1-3 tugboats, and several pipe supply vessels. Impacts would be limited to the time required to lay the pipeline. Trips by service vessels will continue throughout all phases of OCS operations; however, as exploratory and development related activities decline, associated material transport and service trips will also decline. The remaining production-related trips (worker transport, supply, and service) will become standard. These trips will be primarily directed between onshore operation bases and offshore production areas.

Navigational or operational errors in the vicinity of structures may result in collisions. Consequences might include injury, loss of life, oil spills, and release of debris. The release of a ship's cargo could present a serious threat to the environment if the cargo is hazardous. Vessel to vessel collisions and vessel collisions with OCS structures have been relatively few due to the existing network of fairways in the Gulf, the traffic coordination and regulation of marking requirements for rigs and platforms by the USCG, and the issuance of permits for the erection of structures on the OCS by COE (COE now issues a nationwide permit).

(iii) Impact analysis

The area has been the site of oil and gas (primarily gas) activities for some time. Its offshore infrastructure and onshore support bases are not as extensive as those in the Central Gulf, but they are fairly well-developed. No new port facilities are expected to be required as a result of the proposed action.

OCS-related vessel traffic is expected to increase by 8%, or about 16,000 trips, in the peak year of activity over the current annual level of over 205,000 trips associated with oil and gas and other activities. Approximately 76 structures are expected to be emplaced as a result of the proposed action. There are currently 256 platforms. It is unlikely that the additional structures will create a significant hazard to navigation if regulations pertaining to adequate marking are adhered to and if locations are made known to mariners.

CONCLUSION: Increased vessel traffic expected in the peak year of activity and structures resulting from the proposed action indicate that impacts on affected marine transportation and ports will be very low.

CUMULATIVE IMPACTS: Cumulative impact producing factors considered in this analysis include those related to the proposed action, prior OCS traffic, and non-OCS related marine traffic.

The impact analysis for the proposed action is based on expected increases in OCS-related vessel traffic over existing traffic levels. These existing levels include all known potential impact producing factors, with the exception being those associated with future exploration, development, and production associated with prior sales.

Future OCS activities associated with prior sales and the proposed action are expected to increase vessel traffic levels by 40%, or 83,000 trips, in the peak year of activity over the current annual level of 205,000 trips.

The development of infrastructure related to prior OCS sales and the proposed action is expected to result in up to 615 platforms. The addition of new structures to those already in place could have an impact on navigation. The emplacement of additional structures will be paced over a period of 10 years, which should alleviate some of the potential impacts. The high levels of traffic utilizing the pass from the Gulf into Galveston Bay indicate that structures emplaced in this area could be hazardous to navigation. There is, however, a major safety fairway system in the area that should help prevent problems.

CONCLUSION: Increased vessel traffic, structures, and all other potential impact producing factors indicate that during the peak year activity the cumulative impacts on ports and marine transportation will be high. In the long term, impacts are expected to be low.

(h) Impacts on military uses

(i) Impact factors

The major factors affecting offshore military use are the, placement of drill rigs for long periods of time, the permanent installation of platforms, traffic from service vessels and helicopters, and radio communication between offshore locations which may disrupt military communications.

(ii) Impact analysis

The two major military operating areas are W-602 in the center of the planning area and W-228 which is located in the portion of the planning area near the Texas coast. Area W-602 is used by the Air Force but not very intensively, and oil and gas operations have not affected the area very much in the past due to its distance from shore and location in deep water. Area W-228 in intensively used by the Navy and is also the location of considerable oil and gas activity.

Because of the location of W-228 near areas of high hydrocarbon potential, it can be expected that some of the exploratory activity and attendant surface and air traffic will be located within that area possibly causing the modification of the training area used by pilots training for carrier operations from the

Carpus Christi naval base. Oil and gas related traffic and short-term operations such as pipeline laying could also cause short-term delays in certain activities. The result of these conflicts would have low impacts on W-228.

Being further from shore, W-602 is less likely to receive heavy activity from oil and gas operations, and due to the law level of military use of the area, impacts are expected to be very low.

CONCLUSION: The estimated level of impacts on military use of the warning areas is expected to be low.

CUMULATIVE IMPACTS: Cumulative impacts will relate to oil and gas development related to past sales, development as a result of the proposed action, and present and future trans-Gulf vessel traffic to and from Western Gulf ports and commercial and recreational fishing vessels.

The impacts from past oil and gas sales have been low. In W-228, there are over 231 active leases, at least 100 wells have been drilled, and 12 platforms have been installed. All development is in the western half of the warning area. In W-602 where there are 84 leased blocks, over 100 wells have been drilled, and 21 platforms in place. All development is in the northern one-third of the warning area. The impacts from past leasing have been low.

In addition to the impacts from oil and gas activities, ocean-going vessel traffic, and commercial and recreational fishermen and boaters affect military operations in the Western Gulf of Mexico. In 1982, 164,288 vessels entered and exited ports in the Western Gulf. Of this total, 17,523 vessels of draft greater than 18' traversed the fairways of the deep Gulf waters. All vessel traffic close to shore in the vicinity of W-228 poses an operational problem to carrier manuevers and pilot training within the area. Warning Area 602 is in deepwater and would be affected by trans-Gulf vessel traffic only. At present, the military has no operational control, and, in many cases, no warning of when and where this traffic will be passing into or crossing through the warning areas. Commercial fishing vessels are covered in the above statistics for all vessel traffic; however, recreational fishermen and boaters are not. Warning Area 602 will not be affected by the recreationalists due to its distance from shore. Warning Area 228, in extending in to shore, has large numbers of recreational fishermen, sailboaters, and other recreational boaters passing into and through the warning area. The impact from vessels, other than oil- and gas-related vessels, is far greater than the impacts projected from oil- and gas-related vessel traffic.

All air traffic is controlled by the FAA, and civilian air traffic into the warning areas is either curtailed, prohibited, or in most cases, rerouted to avoid conflicts with military operations during their peak or intensive use periods.

CONCLUSION: The estimated levels of cumulative impacts on the Western Gulf warning areas are expected to be low in W-602 and moderate in W-228.

(6) Subarea Deferrals

One subarea in the Western Gulf of Mexico planning area is proposed to be deferred from leasing in the 5-year program. This subarea, the East and West Flower Garden Banks, consists of two blocks covering unique coral reef communities. The Flower Garden Banks are the only examples of extensive tropical Caribbean coral reef communities found in the northern Gulf. Over 250 species of benthic invertebrates and more than 100 species of fishes inhabit the banks. Above 25-29 meters the bank is covered with a thriving submerged coral reef which, except for its total lack of shallow water alcyonarians, is a good example of the Diploria-Montastrea-Porites community so common on reefs in the Caribbean and southern Gulf. In addition, the bank harbors sizable knolls occupied almost entirely by populations of the small branching coral Madracis mirabilis. Finger-sized remains of dead Madracis are extremely important components of the sediment on and adjacent to the reef. In some cases the coarse carbonate sand which typically occurs between coral heads in the Diploria-Montastrea-Porites Zone is entirely supplanted by Madracis rubble. The Flower Garden Banks have been designated as an Active Candidate in the process taken by NOAA leading to sanctuary designation (49 FR 30988-30991 of August 2, 1984). Deferral of this subarea would preclude impacts to the banks within Blocks A-398 and A-375, High Island Area, East Addition, South Extension from oil and gas drilling production operations. The discharge of drilling muds, cuttings, sands, and produced waters directly on the banks, causing smothering and toxic effects to the sensitive organisms there-on, would be avoided. Toxic effects on these organisms could result in long-term or permanent denuding of areas within close proximity to drilling and production activities. Direct physical impact from rig emplacement and anchoring of supply vessels would also be avoided. Deletion of this area would also preclude oil spills and blowouts from originating within the immediate area of the banks, thus, serving as a buffer to these adverse impacts.

b. Unavoidable Adverse Impacts

(1) Physical environment

Water Quality: Normal offshore operations would have unavoidable effects to varying degrees on the quality of the surrounding water if the proposed action is implemented. Drilling, construction, and pipelaying would cause an increase in the turbidity of the affected waters for the duration of the activity periods, and, in the case of pipelines, could distrub settled pollutants. A turbidity plume, several hundred yards in length, could also be created by discharge of drill cuttings and the adherent drilling fluids. This, however, would only affect water in the immediate vicinity of the rigs. The discharge of treated sewage from the rigs and platforms would increase the levels of suspended solids, nutrients, chlorine, and BOD in a small area near the discharge points. Chronic spills from platforms and the discharge of formation waters will result in increased hydrocarbon levels andpossibly trace metal concentrations in the water column. Overall, the effect will be the degradation of water quality around platforms, although the extent of the impact will extend only from a few meters to a few tens of meters from the platform site. Unavoidable impacts to onshore water quality will also occur as a result of runoff from construction sites of new facilities, but these impacts will be localized in the vicinity of these sites, and of limited duration. Some additional impact will accrue from increased sewage due to population growth in certain communities. Regulatory requirements of State water authorities (under Federal and State regulation and guidelines) and some local jurisdictions would be applicable to most, if not all, of these potential impact situations. Therefore, the opportunity would exist to effectively mitigate potential impacts if the applicable regulatory measures were strictly enforced.

Air Quality: Unavoidable adverse impacts to air quality would occur onshore adjacent to crude oil refineries, gas processing plants, and areas of concentrated OCS activities. Unavoidable short-term impacts to air quality would occur near catastrophic events (oil spills, blowouts with fire, and blowouts without fire) due to evaporation and combustion. Mitigation of long-term effects will be accomplished through existing regulations. However, short-term effects from nonroutine catastrophic events (accidents) are uncontrollable.

(2) Biological environment

Fish Resources: Mortalities of finfish and shellfish eggs and larvae and smothering and destruction of shellfish would be caused by oil spills, operational discharges, and pipeline placement.

Marine Mammals: Some injury or mortality to individual marine mammals could result from OCS-related oil spills and/or collision with offshore support vessels.

Coastal and Marine Birds: Some injury or mortality to individual and/or local populations of coastal and marine birds could result for OCS-related oil spills.

Endangered and Threatened Species: OCS-related oil/gas vessel traffic in the Western Gulf could result in some collision injuries to marine turtles. Oil spills could result in some injury or mortality to marine turtles and brown pelicans.

Seagrasses and Wetlands: There is a possibility that two spills greater than 1,000 bbls could occur and contact land within 10 days over the production life of the proposed action. If an oil spill does contact seagrasses or wetlands, adverse environmental impacts could be low for seagrasses and moderate for wetlands. Oil contamination could kill an undetermined amount of coastal vegetation. The adverse effects of oil on seagrasses and wetlands would be relatively long-term.

Some construction of new pipelines/infrastructure is expected. Some unavoidable adverse impacts to seagrasses and wetlands are expected from this phase of oil/gas-related activities.

(3) Socioeconomic Environment

Commercial Fisheries: Of the various types of fishing gear in use in the OCS areas, trawls have the greatest chance for operational conflicts with oil and gas activities. Losses may, however, be compensated under the Fishermen's Contingency Fund or other legal routes. Trawl nets can be snagged on underwater stubs causing damage or loss of the nets. In addition, it is conceivable that snags could damage underwater production equipment or pipelines causing the spill of oil and gas. Because safety equipment is installed, which shuts in production when a loss of pressure occurs, the likelihood of a major spill resulting thereby is considered very small. Less frequently, large objects which were lost overboard from petroleum industry boats, pipeline lay barges, and platforms are caught by fishing gear, resulting in damage to the gear and/or its catch. Occurrence of this type of incident is low. Also, commercial fishermen would probably not harvest fish in the area of an oil spill, as spilled oil could coat or contaminate commercial fish species rendering them unmarketable. Other unavoidable adverse impacts include loss of fishing space caused by the installation of unburied pipelines, rigs, and platforms, or by other OCS-related structures. There may be some localized competition for shore facilities.

Recreation and Tourism: Even though existing regulations and orders prohibit indiscriminate littering of the marine environment with trash, offshore oil and gas operations involving men, machines, equipment, supplies, confined work spaces, and harsh weather will result in some littering of the ocean. Floatable or bouyant trash entering the ocean environment will eventually come ashore and contribute to the human and natural flotsam and jetsam, impacting aesthetics and contributing to maintenance requirements of shorefront recreational beaches. MMS and the oil and gas industry are increasing educational, operational, and compliance efforts aimed specifically at keeping ocean litter from OCS operations to a minimum. Drilling rigs and production platforms operating in nearshore waters will present an intrusion to the natural background view-scopes of shorefront parks, resorts, and scenic highways. Beyond 15 miles of shorefront park and recreation areas, oil and gas operations are rarely visible from shore and become undistinguished from ships when perceptible.

Marine Vessel Traffic and Offshore Infrastructure: A certain amount of interference between vessel traffic and offshore structures will occur as a result of the proposed action. This could lead to an increase in accidents involving OCS vessels and structures. Most foreign flag vessels and others who may be unaware of the locations of structures in an area will generally use the extensive network of safety fairways, which provide clear passage 2 nmi in width through the developed areas of the Gulf. Those more familiar with an area may choose not to use the fairways. Coast Guard regulations regarding structure safety lights and horns, and ship safety regulations are important factors in minimizing conflicts and preventing accidents between structures and vessels on the OCS. However, with vessel operations at night, in rough water or in fog, the potential for accidents increases.

Militay Use: In this planning area, the trips of helicopters and service boats, and the location and number of exploration rigs and production structures will produce unavoidable adverse impacts on military use of the warning areas to the extent that military missions could be curtailed or shifted to another location within a warning area. In particular, this is an increasing concern where the impacts could significantly influence military training and testing to the extent that they jeopardize the lives of military personnel and/or oil- and gas-related personnel working in the areas.

c. Relationship Between the Short-term Use of Man's Environment and the Maintenance and Enhancement of Long-term Productivity

The principal short-term use of the leased areas in the Gulf under the proposals would be for the production of between an estimated 1.5 billions bbls of oil and an estimated 14.8 tcf of natural gas resulting from the proposed actions.

This activity would temporarily interfere with tourism in the region in the event of a major oil spill (1,000 bbls or more) contacting popular tourist beaches. The short-term recovery of hydrocarbons may have long-term impacts on offshore biologically sensitive areas or archaeological resources.

The proposed leasing may also result in onshore development and population increases which may cause very short-term adverse impacts to local community infrastructure, particularly in areas of low population and minimal existing industrial infrastructure. However, these impacts will occur only in the very short run. A return to equilibrium can be quickly expected as population changes and industrial development are absorbed in expanded communities.

After the completion of oil and gas production, oil spills and their impacts will not occur, and the marine environment is generally expected to remain at or return to its normal long-term productivity levels. It has been recognized that continuous, low-level pollution from toxic chemicals, including oil, may adversely affect long-term ocean productivity. However, to date there has been no discernible decrease in long-term marine productivity in OCS areas where oil and gas have been produced for many years. However, until more reliable data become available, the long-term effects of the chronic and major spillage of hydrocarbons and other drilling-related discharges cannot be accurately projected. In the absence of such data, it must be concluded that the possibility of decreased long-term productivity exists as a result of the proposed actions. It is possible that such high value areas as the Flower Garden Banks will suffer long-term losses as a result of these proposals.

OCS development off Louisiana and Texas has supported recreational and commercial fishing activities and has stimulated the manufacture and sale of larger private fishing vessels and special fishing and recreational equipment. Additionally, commercial enterprises such as charter boats have become heavily dependent on offshore structures for satisfying recreational customers. These proposed sales will increase these incidental benefits of offshore development. OCS platforms and structures harbor encrusting organisms, increase marine biomass and become high profile de facto artificial reefs. Fishing and diving activity in direct association with oil and gas structures can be anticipated by recreational and commercial fishermen and scuba divers during the 10-30 years of offshore operations when located in productive fishing locations accessible to offshore fishermen. In order to maintain the long-term productivity of site-specific, artificial reef locations attractive to fish, fishermen and divers, some means, such as proliferation of artificial reef development programs, must eventually replace platform removals. The Rigs-toReefs concept embraced by all Gulf States is leading to a planned approval towards maintenance and expansion of the fishery enhancement benefits inherent in retiring oil and gas structures.

In summary, short-term environmental socioeconomic impacts would result from the proposed leasing schedule, including possible short-term losses in productivity as a result of oil spills. Long-term adverse environmental impacts could be expected only if the biological and cultural resource stipulations options are not adopted, but even then some risk remains due to the potential for accidents. Oil and gas reserves would be lowered. Few long-term productivity or environmental gains are expected as a result of these proposals; the benefits of the leasing schedule are expected to be principally those associated with a medium-term increase in supplies of domestic oil and gas. While no reliable data exist to indicate long-term productivity losses as a result of OCS development, such losses are possible. However, to the extent that OCS development would replace imports of oil which would otherwise be required, such losses as a result of tanker-related oil spills may occur in the absence of these proposals.

d. Irreversible and Irretrievable Commitment of Resources

(1) Biological environment

Fish Resources: Mortality of finfish and shellfish resulting from oil spills would be the irreversible and irretrievable commitment of fish resources.

Seagrasses and Wetlands: An irreversible and irretrievable commitment of biological resources could occur where seagrasses and wetlands are impacted by frequent oil spills and chronic, low-level contamination with oil. Repeated contact with oil will destroy wetlands vegetation, which results in soil erosion and land loss.

Construction and emplacement of infrastructures and pipelines in coastal wetlands can result in the permanent loss of wetlands due to the mechanical destruction of plants and to the land loss facilitated by saltwater intrusion followed by erosion of marsh soils.

(2) Socioeconomic environment

Employment and Demographic Conditions: The proposed action would result in the production of certain OCS-related goods and services. To the extent that resources would be drawn away from other uses, production of goods and services in other areas of other types would be foregone. Steel products, specialized manpower, and capital constitute required resources which may be scarce; use of these resources for OCS needs means that other opportunities for their use might have to be foregone. While these resource may be reclaimed over time, their use as a result of the proposed action would constitute an irreversible and irretrievable commitment of resources at a given point in time. To the extent that underemployed labor resources are used to fill new job opportunities, this would not constitute a cost to society in the form of foregone labor opportunities.

Commercial Fisheries: Irreversible and irretrievable commitment of commercial fisheries resources could occur from oil spills and gear conflicts. Oil spills would result in mortality of finfish and shellfish, and gear conflict would result in loss of catch.

Archaeological Resources: Although the expected impact to archaeological resources as a result of the proposed action is uncertain, any interaction between an impact producing factor (drilling of exploratory, delineation and development wells, placement of platforms, subsea completions, and pipeline installation) and a significant historic shipwreck or prehistoric site would destroy information contained in the site components and in their spatial distribution. This would be an irretrievable commitment of potentially unique archaeological data.

e. Impacts of a High Case Scenario

(1) Physical environment

(a) Impacts on water quality

The estimated discharge of up to 1.19 billion bbls of formation waters, 22.2 million bbls of drilling muds, 2.49 million cu. yds. of drill cuttings, 0.66 million bbls of sand from drilling operations, and an average of 5,500 gallons/day/platform of treated sanitary and domestic wastes may be expected as a result of this scenario. Pipeline-related activities would result in the disturbance of up to 17.9 million cu. yds. of sediment.

Offshore waters will be subject to impacts from discharges of drilling fluids, formation waters, and other effluents which add burdens of both toxic and nontoxic materials to the water column. However, the natural processes of dispersion, degradation, and sedimentation will result in immeasurably low concentrations of these materials within a few meters to a few kilometers of the discharge site, resulting in low impacts.

Discharge from onshore support facilities is estimated to be minimal with impacts to onshore water quality expected to be very low. These impacts may stem from the construction and operation of OCS onshore support facilities, particularly the estimated 6 new gas processing plants, 200-1,100 miles of onshore pipelines, and 8 new service bases projected.

CONCLUSION: The overall impact to offshore water quality is estimated to be low; whereas, the impact to onshore water quality is estimated to be moderate.

(b) Impacts on air quality

In the event a maximum level of hydrocarbons is explored and developed, increased activity on the OCS would expand the air emissions from operations and the opportunity for catastrophic events to occur. Based on a site specific air emission analysis, controls and offsets have not been required for offshore facilities. Should modeling/monitoring studies provide evidence that air emission contributions are significant, air quality controls and/or offsets will be required to meet standards. It is assumed these measures will mitigate environmental impacts.

CONCLUSION: Low impacts are expected in Cameron, Nueces, Galveston, Jefferson, and Brazoria Counties, Texas. Very low impacts are expected throughout the remainder of the coastal area.

(2) Biological environment

(a) Impacts on plankton

The increased activity associated with this scenario will subject the Gulf waters to discharges of drilling fluids, formation waters, and other effluents which add burdens of toxic and nontoxic materials to the water column.

Refer to Section IV.B.4.a.(3)(a) for a discussion of these added burdens. However, the natural processes of dispersion and dilution will result in immeasurably low concentrations of these materials within a few meters to a few kilometers of the discharge site. Only those plankton in the immediate vicinity of the discharge site could be affected.

CONCLUSION: The expected level of impact on plankton is very low.

(b) Impacts on benthos

The benthos of topographic high areas are expected to receive a very high level of impact from the proposed action. Any increase in activity within these areas resulting from the high case scenario would have a very high level of impact on these communities.

CONCLUSION: The expected level of impact is low; however, for benthic communities associated with topographic highs, the impact would be very high.

(c) Impacts on fish resources

Four large spills (1,000 bbls or greater) are assumed under the high case scenario for this area. 2,980 miles of new pipelines are also expected to result under this scenario. A large spill contacting with open bays containing finfish and shellfish nurseries and/or spawning grounds could cause severe, medium-term effects on fish resources. Pipeline placement activities would have localized impacts on fish resources, including the destruction of benthic species, fishery habitats, and increased turbidity. Refer to Section IV.B.4.a.(4)(c) for an additional discussion of impacts on fish resources.

CONCLUSION: The level of expected impact on fish resources is estimated to be moderate.

(d) Impacts on marine mammals

Up to four oil spills of 1,000 bbls or greater and several smaller spills are assumed for this analysis. As indicated previously, only a small portion of the marine mammals would be exposed to potential OCS-related oil spills. Studies by Geraci and St. Aubin (1985) indicate that the effects of oil contact with marine mammals (dolphins) are not severe. However, the effects of vapor inhalation and ingestion of oil-contaminated food or water by marine mammals have not been determined. It is estimated that the level of impact to marine mammals from these oil spills would be low.

Vessel traffic is estimated to increase about 3% under the high case scenario, slightly increasing the potential for collisions with marine mammals. It is estimated that the level of impact to marine mammals from this increased vessel traffic would be very low.

About 4,879 wells will be drilled, and additional seismic activities will be required over the assumed 20- to 30-year period of the proposed action. The effect of this increased activity and noise disturbance to marine mammals is unknown. However, as this disturbance is usually short-term and fairly localized, the level of impact on marine mammals is estimated to be low.

CONCLUSION: The level of impact to marine mammals as a result of the high case scenario is estimated to be low.

(e) Impacts on coastal and marine birds

Up to four oil spills of 1,000 bbls or greater and several smaller spills are assumed for this analysis. It is estimated that the level of impact to coastal and marine birds from these oil spills would be moderate.

OCS-related air and vessel traffic is estimated to increase about 3%; up to six oil/gas pipelines and up to three new onshore facilities are estimated under the high case scenario. This potential OCS-related activity is estimated to result in a low level of impact to birds.

CONCLUSION: The level of impact to coastal and marine birds as a result of the high case scenario is estimated to be moderate.

(f) Impacts on endangered and threatened species

As indicated previously, only a small portion of the endangered and threatened species habitat would be contacted by the estimated four oil spills estimated for the high case scenario. It is estimated that the level of impact to endangered and threatened species from oil spills would be moderate.

Air and vessel traffic is estimated to increase about 3% under the high case scenario, slightly increasing the potential for collisions with endangered and threatened species. It is estimated that the level of impact to endangered and threatened species from this increased air and vessel traffic would be very low.

About 17 oil/gas pipeline landfalls, 21 onshore facilities, 1 navigation channel, and an undetermined amount of maintenance dredging of existing canals are estimated under the high case scenario. It is estimated that this activity could result in a moderate level of impact to endangered and threatened species.

CONCLUSION: The level of impact to endangered and threatened species as a result of the high case scenario is estimated to be moderate.

(g) Impacts on seagrasses

Up to four oil spills of 1,000 bbls or greater and several smaller spills are assumed for this analysis. As indicated previously, only a small portion of the seagrasses would be exposed to potential OCS related oil spills. It is estimated that the level of impact to seagrasses from these oil spills would be low.

Up to 17 oil/gas pipelines, 1 navigation channel, and an undetermined amount of maintenance dredging of existing canals are estimated. It is estimated that up to 302 acres of seagrasses could be damaged or destroyed as a result of these activities. This represents a loss of up to 0.1% of the total seagrasses and an estimated low level of impact.

CONCLUSION: The level of impact to seagrasses as a result of the high case scenario is estimated to be low.

Impacts on Wetlands: Up to four oil spills of 1,000 bbls or greater and several smaller spills are assumed to occur as a result of the (high case) proposed action. About one-third of the wetlands would be exposed to potential oil spills and a portion of these wetlands could be damaged or destroyed. It is estimated that the level of impact to wetlands from oil spills could be moderate.

Up to 10 oil/gas pipelines, up to 21 new onshore facilities, 1 navigation channel, and an undetermined amount of maintenance dredging of existing canals are estimated. It is estimated that up to 2,180 acres of wetlands could be damaged or destroyed if these facilities are located in wetland areas. This represents a loss of up to 0.8% of the total wetlands and could result in an estimated moderate level of impact.

CONCLUSION: The level of impact to wetlands as a result of the high case scenario is estimated to be moderate.

(h) Impacts on areas of special concern

The areas of special concern in the Western Gulf tend to be associated with surface expressions of geologic formations which are generally oil and gas producing. Therefore it can be expected that at least a few of the 228 platforms and some of the activity from the 2143 exploratory and deliveration wells will be located near as on these areas. Locations associated with this activity; anchoring, dumping of drill muds and cuttings, and platform construction would all have the effect of breaking and overturning coral growths, smothering coral formations and other sessile marine organisms, as degrading the water quality of the areas through the discharge of effluents such as formation waters and chronic hydrocarbon releases. Without special protection the high case would have a very high level of impact.

CONCLUSION: The expected level of impact is very high.

(i) Impacts on marine sanctuaries

The Flower Garden Banks, an active candidate far sanctuary status, are sensitive to direct contact with oil and gas operations. Should the Flower Garden Banks not receive full sanctuary status, oil and gas activity with the resulting anchoring, platform construction and effluent discharge could effect the reef communities on the Banks. Should any of the expected 228 platforms and 2143 exploratory wells be located on or very new to the coral communities, anchoring of service vessels and drill rigs, and the construction of production platforms could physically damage the coral formations while discharged drill muds and cuttings could smother coral and other sessile organisms on reduce water quality to such an extent that the organisms of the Banks could become more subject to disease or predation. Therefore the high case could be expected to have a high level of impact on the Flower Garden Banks. However, see Section IV.B.4.a.(b) as this subarea has been deferred from leasing the 5-year program.

CONCLUSION: The expected level of impact is very high.

(3) Socioeconomic Environment

(a) Impacts on local employment and demographic conditions

This scenario is expected to generate a greater level of employment in the Western and Central Gulf coastal regions than the development scenario associated with the proposed action. Unlike the analysis associated with the proposed action, there will be new resident activity associated with the high case. New resident employment, payroll, and population is expected to peak in the year 2000 over a 13-year period at about 19,000 jobs, $220 million, and 44,000 people, respectively. A breakdown of these new resident projections by coastal subarea indicates the impact in the Western coastal subareas to be very low, i.e., less than 1% of the total employment, payroll, and population in the region. However, the impact in the affected Central coastal subarea (Southwest Louisiana) is expected to be low since peak new resident activity will represent about 2% of the total employment, payroll, and population in that subarea. This analysis assumes that the sales in the Central Gulf will also be held. Without these sales, the employment generated by lease sales on the affected Central coastal parishes would represent a maintenance of existing oil- and gas-related employment rather than new resident employment, and the impact on those parishes would therefore be negligible.

CONCLUSION: The expected levels of impact are very low.

(b) Impacts on coastal land uses

An higher level of oil and gas activity under the high case scenario would cause oil- and gas-related land uses to operate at higher capacities and may require under utilized or dormant used land to become active. In some situations, new facilities may be required and would involve the conversion of existing developed land or the improvement of raw land. State and local land use policies indicate that potential incompatabilities or conflicts can be avoided or effectively mitigated through a sufficiently flexible regulatory framework, capable of reconciliation of most site-specific problems which may emerge after a sale.

CONCLUSION: The expected level of impact on State and local land use will be low.

(c) Impacts on water supply

The addition of up to eight new service bases, two new platform fabrication yards, and six new gas processing plants will impact area water supplies as a result of this scenario. As a result of this, the impacts to the regional water supply are expected to be high, with several areas being substantially affected and requiring modification of existing facilities.

CONCLUSION: The impact on area water supply is estimated to be high.

(d) Impacts on commercial fisheries

An estimated 228 platforms are expected under the high case scenario, eliminating less than 0.1% (684-1,140 acres) of the trawling area. Four large spills (1,000 bbls or greater) are assumed for this area under the high case scenario. A large spill contacting the open bays containing finfish and shellfish nurseries and/or spawning grounds could cause severe, medium-term effects on fisheries. Refer to Section IV.B.4.a.(5)(d) for an additional discussion of impacts on commercial fisheries.

CONCLUSION: The level of expected impact on the commercial fishing industry is estimated to be moderate.

(e) Impacts on recreation and tourism

Continued leasing under a high case scenario will result in the additional installation of an estimated 284 new offshore platforms through the year

2007. These platforms and the prerequisite exploratory drilling rigs will be at least 10 miles from shore and coastal shorefront recreational and tourist centers. Those platforms and drilling rigs operating within 10-15 miles of shore will be visible from shore during clear weather conditions and will impose a limited amount of distraction from the background viewshed of coastal recreation shorefronts. Those production platforms are installed within 25 miles of major population centers and resort communities and are likely to become popular fishing locations.

Assuming the high case scenario results in multiple oil and gas field discoveries throughout the planning area, additional pipeline landfalls can be expected to accommodate product transmission to processing and refinement centers. Additionally, the potential for oil spills occurring and contacting shorefront recreational resources is likely to increase. The amount of trash and debris washing ashore from offshore operations will also increase.

CONCLUSION: The overall effect on recreation and tourism is expected to be moderate.

(f) Impacts on archaeological resources

(Historic) Under the high case scenario, the percent of acreage leased that will be disturbed by projected development in archaeological Zone 1 (where the potential for shipwreck occurrence is assessed as being high) is 13%. Therefore, although there is the potential for a loss of significant historic archaeological data should a direct interaction occur between an impact producing factor and an historic shipwreck, the potential for such an interaction occurring is assessed as being moderate.

Under this scenario, a maximum of up to 15,888 acres could be disturbed as a result of onshore development. Due to the visibility of most onshore historic sites and State and Federal cultural resource laws which require consideration of historic properties if any State or Federal funding or permits are required for construction, the expected impact to coastal historic sites as a result of the projected onshore development associated with this scenario is low.

Up to four oil spills of 1,000 bbls or greater and several smaller oil spills are assumed for this analysis. Should one or more of these spill contacts be with a coastal historic site such as forts and lighthouses, the major impact would be visual due to oil contamination of the site and its environment. This impact would probably be temporary and reversible with no actual loss of information.

CONCLUSION: The impact level expected from this scenario is low.

Impacts on Archaeological Resources: (Prehistoric) Under the high case scenario, acreage leased that will be disturbed by projected development in archaeological Zones 1 and 2 (where the potential for prehistoric site occurrence is assessed as being high) is 13%. Therefore, although there is the potential for a loss of significant prehistoric archaeological data should a direct interaction occur between an impact producing factor and an inundated prehistoric site, the potential for such an interaction occurring is assessed as being moderate. Under this scenario, there could be a maximum of 15,888 acres disturbed by onshore development. Due to State and Federal cultural resource laws which require consideration of cultural resources if any State or Federal funding or permits are required for construction, the expected impact to coastal prehistoric sites as a result of the projected onshore development associated with this scenario is low.

Up to four oil spills of 1,000 bbls or greater and several smaller oil spill contacts are assumed for this analysis. Should one or more of these spill contacts be with a coastal prehistoric site, the potential for dating the site using Carbon-14 would be destroyed. However, if diagnostic artifacts are present in the site, loss of C-14 dating potential may not constitute a loss of unique information.

CONCLUSION: Impacts on prehistoric archaeological resources is expected to be low.

(g) Impacts on marine transportation and ports

Vessel traffic is expected to increase by 24%, or 49,000 trips, in the peak year of activity over the current annual level of 205,000 trips associated with oil and gas and all other activities. Approximately 228 structures are expected to be added to the 256 platforms currently. The addition of the new structures could have a significant impact on navigation; however, their emplacement will be paced over a period of about 18 years which should aleviate some of the potential impacts.

CONCLUSION: Increased vessel traffic expected in the peak year of activity and structures resulting from the proposed action indicate that impacts on affected marine transportation and ports will be moderate.

(h) Impacts on military uses

For this scenario, the highest number of wells projected to be drilled in W-228 would be 86, with 4 platform installations. There are 12 platforms existing within W-228, which already present some conflict with Naval carrier operations. The additional four platforms in place and a possible 3-5 exploration rigs per year could cause a moderate level of impact on military operations.

Within W-602, the highest number of wells anticipated for this scenario would be 99, with 6 platforms installations. With the low intensity and frequency of USAF operations indicated in W-602 and the concentration of oil and gas activities in the northern one-third of the warning area, the level of impact could be moderate.

Conclusion: The high case scenario will cause a moderate level of impact on Naval operations in W-602 and a moderate level of impact on W-602.

f. Alternative II - Deletion of Subareas

This alternative evaluates the deferral from leasing, in this 5-year program, of 13 subareas in addition to those deferred under the proposed action. None of these additional subareas are located within the Western Gulf; therefore, it is anticipated that the adoption of this alternative will have no affect on the resource and infrastructure estimates projected under the proposed action. The expected levels of impact, on the various topics of concern, will threfore be the same as for the proposed action.

g. Alternative III - Add a Sale in the Straits of Florida

This alternative would add a lease sale (1991), in that portion of the Florida Straits planning area south of the Florida Keys, to the 5-year leasing schedule as prescribed under the proposed action. This alternative concerns the adding of a sale to the 5-year schedule which would not take place near the Western Gulf of Mexico, and therefore which would have no effect on this planning area. It is anticipated that the addition of this sale will have no affect on the resource and infrastructure estimates projected for the Western Gulf under the proposed action. The expected levels of impact, on the various topics of concern, will therefore be the same as for the proposed action.

h. Alternative IV - Biennial Sales in All Planning Areas Except the Central and Western Gulf of Mexico

This alternative proposes a biennial pace of leasing in those Federal OCS leasing areas which have triennial sales under the proposed action. The alternative retains the annual leasing pace in the Central and Western Gulf; therefore, it is anticipated that this alternative will have no affect on the resource and infrastructure estimates projected for the Western Gulf under the proposed action. The expected levels of impact in the Western Gulf, on the various topics of concern, will therefore be the same as for the proposed action.

i. Alternative V - The Acceleration Provision

This alternative evaluates the effects of the implementation of the acceleration provision in all areas outside of the Western and Central Gulf which have a triennial pace of leasing under the proposed action. The alternative provides the flexibility needed to adjust the 5-year program's schedule in the event of major unforeseen developments permitting this acceleration from triennial to biennial sales. The alternative; however, retains the annual leasing pace in the Central and Western Gulf; therefore, it is anticipated that this alternative will have no affect on the resource and infrastructure estimates projected for these areas under the proposed action. The expected levels of impact in the Western Gulf, on the various topics of concern, will therefore be the same as for the proposed action.

j. Alternative VI - Defer Leasing in Six Planning Areas

This alternative evaluates the deferral from leasing, during the proposed 5-year program, six Federal OCS planning areas. The Western Gulf is not included as one of these areas to be deferred; therefore, it is anticipated that the adoption of this alternative will have no affect on the source and infrastructure estimates projected under the proposed action. The expected levels of impact, on the various topics of concern, will therefore be the same as for the proposed action.

k. Alternative VII - No Action

Impact Analysis

This alternative is equivalent to cancellation of the 5-year OCS Oil & Gas Leasing Schedule. The 5 sales which would be held in this area as a result of the adoption of this 5-year schedule would not be held. Currently ongoing activity would not cease, nor would new activity on already leased blocks be stopped. Therefore, the opportunity is foregone or postponed for development of the estimated 0.44 billion bbls of oil and 6.2 tcf of gas in the Western Gulf, which could have resulted from these proposed sales. This could cause alteration of the energy mix at the National/regional level and could exert movement toward other energy alternatives.

Development of alternative energy supplies as replacement resources for lost domestic OCS oil and gas production include: energy conservation; conventional oil and gas supplies; coal; nuclear power; oil shale; tar sands; hydroelectric power, solar and geothermal energy; and imports of oil, natural gas, and LNG. These alternative energy supplies are discussed in Appendix C.

It is difficult to predict the extent to which the development of alternative energy supplies may be necessary since other factors are involved, such as the continuing success of energy conservation by the American public, overcoming technical and economic barriers that presently exist in developing other alternative energy sources, and improving resource recovery recovery methods to increase the rate of recovery. For more information on these alternative approaches to our Nation's energy needs, refer to the following: "Energy Alternatives: A Comparative Analysis" (Oklahoma, University of, 1975) which was prepared under contract for BLM; "Environmental Quality - 1982" (CEQ, 1982); and "Reference Paper #9, Energy Alternatives" (USDI, BLM, 1979). Activities expected to result from this proposal, the drilling of over 1,600 wells of all types, resulting in the discharge of over 7 million barrels of drill muds and over 200,000 barrels of cuttings, and the construction of up to 76 platforms would not take place as scheduled. Immediate effects in the planning area would not be noticeable as currently ongoing activity would continue. The environmental effects would become noticeable in five or more years as major, expanding oil and gas fields could not be developed as rapidly because of the lack of newly acquired tracts. The drilling of exploratory and delineation wells and the construction of platforms in those areas, an new tracts, would not take place. Therefore environmental impacts expected on tracts that would have been rented as a result of this proposal would not take place in the immediate future. It is unlikely that activity would cease however, as much exploration and production remains to be carried out on currently rented tracts. The impacts on the various resources would therefore continue to occur to the present rate. The principle difference would be that localized impacts would not occur on tracts that would have been leased due to the adoption of this schedule. The economic impacts of cancellation of these sales could be far-reaching. Increased exploration activity on recently acquired leases could partially offset a one-year delay, resulting in negligible socioeconomic impacts. A lengthy delay, however, could seriously affect the economic stability of the coastal region. The infrastructure for oil and gas production in the Gulf of Mexico is highly concentrated in the coastal areas of Louisiana and Texas. The OCS oil and gas program is a major source of employment and revenue in the area. Approximately 130,000 jobs are directly or indirectly dependent on the offshore program. The average annual payroll associated with oil and gas activities amounts to approximately $2.9 billion for the Gulf Coast region. The State and local taxes generated annually by the Federal program are approximately $232.6 million. Cancellation of these sales could reduce the amount of exploration activity, the number of exploratory wells drilled, the number of workers and facilities employed by the industry, and the payroll and tax revenues generated.

CONCLUSION: Environmental impacts on tracts that would have been leased as a result of this proposal would be avoided or delayed but overall environmental impacts to the planning area would continue occurring at the present rate. See Section II.A.7. for a summary of impacts of alternative energy sources. Some adverse socioeconomic impacts could include a loss of employment opportunities, payroll revenues, and tax revenues.

5. Central Gulf

a. Alternative I - Proposed Action

(1) Interrelationship of Proposal with Other Projects and Proposals

(a) National parks and sanctuaries

Gulf Islands National Seashore, located along the shorefront of the eastern side of the planning area, includes a rather widely spaced chain of offshore islands that extends nearly 150 miles from Ship Island, Mississippi, to Santa Rosa Island, Florida. Other islands include Horn and Petit Bois, which are units of the National Wilderness System, and part of Perdido Key. In addition, the Seashore includes three mainland tracts: one near Pensacola; one near Gulf Breeze, Florida (Naval Live Oaks); and another at Davis Bayou, adjacent to Ocean Springs, Mississippi. Besides the preservation of barrier island wilderness values at Horn and Petit Bois Islands, the Seashore is managed for protection and public appreciation and use of its historic and natural resources. Except for acquisition and control of a few inholdings, land acquisition within the Congressionally authorized boundaries is completed. OCS oil and gas development is compatible with the purpose and objectives of the Seashore, and the enabling legislation creating the park specifically allows the Secretary of the Interior to permit environmentally acceptable rights-of-way and easements for the transmission of future oil and gas discoveries.

Jean Lafitte National Historical Park, established in 1982, is focused on the preservation and interpretation of the natural, historical, and cultural resources of the Mississippi Delta Region. This park is still in its preliminary land acquisition phase; however, the identified core area and park protection zone in southeast Louisiana should be unaffected by continued OCS leasing and development.

There are no proposed or existing sanctuaries located on the OCS in the Central Gulf of Mexico.

(b) Coastal Zone Management

Refer to Section IV.B.4.a.(1)(b) for a discussion of coastal zone management within the Gulf of Mexico.

(c) Military Uses

Refer to Section IV.B.4.a.(1)(c) for a discussion of military uses within the Gulf of Mexico. See figure III B 1B-1 for the location of military areas in the planning area.

(d) Ocean Dumping

There are no EPA designated ocean dumping sites in the Central Gulf of Mexico.

(2) Projects Considered in Cumulative Impact Assessment

For a description of projects considered in the cumulative, see Section IV.B.4.a.

(3) Physical Environment

(a) Impacts on water quality

The impact factors and effects for water quality are discussed in Section IV.B.4.a.(3)(a).

(i) Offshore

Impact analysis: Impacts to offshore water quality will occur as a result of increased OCS activities in the Central Gulf. The addition of some 1,246 exploration/delineation wells, 1,596 development/production wells, 133 platforms, and up to 750 miles of pipelines are estimated for this area. Under this scenario, the discharge of an estimated 0.01-0.896 billion bbls of formation waters, 12.9 million bbls of drilling muds, 1.45 million cu. yds. of drill cuttings, 0.5 million bbls of sand from drilling operations, and an average of 5,500 gallons/platform/day of treated sanitary and domestic wastes from platforms may be expected as a result of this alternative. Pipeline-related activities would result in the disturbance of up to 4.5 million cu. yds. of sediment under the same scenario. Most offshore impacts would be localized around OCS facilities and will be of a temporary nature due to dilution and dispersion characteristics of the receiving body of water. Three oil spills greater than or equal to 1,000 bbls are projected for the Central Gulf as a result of OCS production. Petroleum hydrocarbons introduced into the marine and coastal waters as a result of this spill may have varied effects on the local biota with impacts ranging from negligible to very high, depending on the resource impacted, the stage of weathering, and the local physical and meteorological parameters. Normal weathering processes, encountered with oil spilled into open water conditions tend to detoxify the spilled oil by breaking down the toxic components of the oil.

Immediate effects would be brought on by increased drilling, construction, and pipelaying activities, causing an increase in water column turbidities of the affected waters. Such increases would have a nominal impact on the productivity of phytoplankton, but may cause a temporary clog in the respiratory and feeding mechanisms of numerous benthic and pelagic marine organisms within the area of construction. Pipeline construction activities may also result in the resuspension of settled pollutants, toxic heavy metals, and pesticides, if present.

The discharge of treated sanitary wastes from the various rigs and platforms will increase levels of suspended solids, nutrients, chlorine, and BOD in a small area near the point of discharge.

During the course of exploration, drilling, production, and workover phases resulting from the proposed action, the discharge of drilling fluids, cuttings, produced water, and sand will degrade the quality of the waters surrounding the proposed new platforms.

Offshore water quality degradation will occur within the immediate vicinity of exploration and production sites with high impacts expected to occur within a few meters to tens of meters from the discharge source. These impacts, however, will decrease to very low with distance (500-1,000 m) from the source.

CONCLUSION: The overall impact to offshore water quality is estimated to be low.

CUMULATIVE IMPACTS: Increased oil/gas exploration and development activities in the Central Gulf will contribute to the cumulative impacts on offshore water quality in this region. These activities, along with ocean dumping and increased vessel traffic, are among the contributors to areawide water quality degradation. For a discussion on other factors considered to cumulatively impact water quality, see Chapter IV.B. for the Western Gulf under offshore water quality, cumulative impacts.

Approximately 165 mobile rigs and 2,800 platforms (multiwell) currently operate in the Central Gulf Federal OCS. The construction of several additional pipelines from existing lease blocks in both Federal and State waters may occur in the future as a result of increased development activities in these areas.

The addition of some 3,406 exploration/delineation wells, 3,266 development/production wells, 293 platforms, and up to 1,850 miles of pipelines are estimated for this area as a result of the proposed action and prior OCS sales. This could result in the discharge of up to 3.8 billion bbls of formation waters, 30.4 million bbls of drilling muds, 3.4 million cu. yds. of drill cuttings, and an average of 5,500 million gallons/day of treated sanitary and domestic wastes from platforms. Pipeline-related activities could result in the disturbance of some 1.1 million cu. yds. of sediment.

Offshore waters will, therefore, be subject to cumulative impacts from discharges of drilling fluids, formation waters, and other effluents which add burdens of both toxic and nontoxic materials to the water column. However, the natural processes of dispersion, degradation, and sedimentation will result in immeasurably low concentrations of these materials within a few meters to a few kilometers of the discharge site, resulting in low cumulative impacts.

CONCLUSION: The overall cumulative impacts which include the effects of non-OCS-related factors can be expected to be very high.

(ii) Onshore

Impact analysis: Onshore water quality degradation will occur as a result of increased nonpoint and point sources of pollution, especially in those areas of Louisiana (Calcasieu Basin and the Mississippi Delta), Mississippi

(Pascagoula Area), and Alabama (Mobile Bay) where water quality problems persist. Impacts to onshore water quality will occur as a result of runoff from the construction and operation of onshore facilities supporting expanded OCS activities in this region. The construction of onshore pipeline will create nonpoint source increases in surface runoff to nearby streams and rivers. Nonpoint source impacts may be minimized by

controlling erosional effects generated within construction site boundaries, with several of the adverse impacts being localized and prevented from having offsite impacts to water bodies in the vicinity of these activities. Point source increases would also occur from effluent discharges related to OCS support activities, primarily the discharge of OCS produced waters piped ashore for treatment and discharge; however, any potential adverse impact can be mitigated by Federal and State water pollution control regulations and permitting.

As was shown, produced waters which are piped ashore are subject to treatment prior to discharge, according to Federal and State regulations and permitting requirements. However, it should be noted that this treatment is only used in the extraction of oil and grease contaminants. These waters may, therefore, contain high concentrations of TDS, oxygen demanding wastes, toxic heavy metals, aromatic hydrocarbons, and environmentally high levels of radionuclides. In open ocean situations the discharge of these components appears to contribute minor impacts to the surrounding discharge area; however, in shallow semi-enclosed estuarine environments, impacts could be extremely high depending on the physical and biological components of each system. Additional information on the location of discharge sites, daily discharge rates at each site, and the nature of the environment (background levels, etc.) in each area will be needed to determine the extent of impacts.

Although onshore water quality impacts are estimated to be low, effluents discharged in connection with OCS support facilities may be extremely damaging when released into sensitive habitats having a reduced capacity for pollution assimilation.

CONCLUSION: The overall impact to onshore water quality is estimated to be low.

CUMULATIVE IMPACTS: Increased oil/gas exploration and development activities in the Central Gulf will contribute to the cumulative impacts on onshore water quality in this region. These activities, along with current and future activities associated with State tidelands' oil and gas operations, industrial and municipal waste discharges, ocean dumping, and increased vessel traffic, are among the contributors to areawide water quality degradation. For a discussion on other factors considered to cumulatively impact water quality, see Chapter IV.B. for the Western Gulf under onshore water quality, cumulative impacts.

Approximately 70 platforms are currently operating in the Central Gulf State waters (1985). An unknown number of additional structures may be constructed as a result of resource development in State-owned coastal waters. The construction of several additional pipelines from existing lease blocks in both Federal and State waters may occur in the future as a result of increased development activities in these areas. Pipeline-related activities resulting from prior .CS sales could result in the disturbance of some 11.1 million cu. yds of sediment. Onshore water quality degradation will occur as a result of increased nonpoint and point sources of pollution associated with construction and operation of this new onshore infrastructure.

Offshore and nearshore waters will, therefore, be subject to cumulative impacts from discharges of drilling fluids, formation waters, and other effluents which add burdens of both toxic and nontoxic materials to the water column. However, the natural processes of dispersion, degradation, and sedimentation will result in immeasurably low concentrations of these materials within a few meters to a few kilometers of the discharge site, resulting in low cumulative impacts.

CONCLUSION: The overall cumulative impacts, which include the effects of non-OCS-related factors, can be expected to be very high, primarily in those highly urbanized and industrialized coastal areas currently experiencing water quality problems.

(b) Impacts on air quality

Refer to Section IV.B.4.a.(3)(b) for a discussion on the impact factors and the direct and indirect effects of the proposed action on air quality.

Impact analysis

The ambient air quality in the Central Gulf is generally better than the national standards with violations of the NAAQS occurring in some coastal areas; these areas where violations occur are designated as nonattainment areas. Additionally, there is one PSD Class I area in the coastal region (Breton Wilderness Area) whereby a small amount of degradation to ambient air quality is considered significant. All nonattainment and PSD Class I areas are identified in Section III.B.1.a.(8).

The proposed action is expected to create evenly distributed activity throughout the Central Gulf. In this area, the activity ranges from 1,246 exploration and delineation wells, 1,596 development/production wells, and approximately 133 platforms.

Of these coastal parishes/counties adjacent to offshore development, the ones most likely to be adversely impacted by this activity due to their unique status as nonattainment or having PSD Class I areas are St. John the Baptist, Orleans, Jefferson, St. Bernard, St. Charles, Lafourche, St. Mary, and Plaquemines Parishes, Louisiana.

The expected levels of offshore activities adjacent to the above parishes is not large. Oil and gas activities are not expected to occur simultaneously and are not expected to cause impacts above the level defined as low. Additionally, no significant degradation of onshore air quality is expected from routine offshore operational emissions due to the regulatory control provided in 30 CFR 250.57.

CONCLUSION: Low impacts are expected in St. Bernard, Plaquemines, St. Mary, Lafourche, St. Charles, Jefferson, Orleans, and St. John the Baptist Parishes in Louisiana and Mobile County in Alabama. Very low impacts are expected throughout the remainder of the coastal area of the Central Gulf and in Escambia County in the Eastern Gulf.

CUMULATIVE IMPACTS: Presently, there are estimated to be 100 gas processing plants existing in the Central Gulf with a vast majority located in Louisiana. Additionally, there are 43 refineries assumed to presently exist in the Central Gulf which are also mostly distributed throughout Louisiana. In addition to existing gas processing plants, it is estimated that up to 12 new plants may be required as a result of prior leasing activities. No new oil refineries are projected.

Offshore infrastructure is estimated to be 3,584 platforms, 18,272 production wells and 4,622 exploratory wells as a result of leasing activity through 1984. Emissions for OCS installations is calculated at the time of permitting production facilities. Since records have been kept (June 1980), this air quality analysis has identified a negligible contribution.

Point source emissions from onshore activities, such as non-OCS oil and gas processing, power generation facilities, industrial processing or manufacturing facilities, waste incineration facilities, petrochemical storage facilities, and mobile emissions sources (automobiles, waterborne transportation, etc.) are expected to increase at rates in proportion to the growth of population. Energy conservation, improved automobile emission controls, alternative (non-fossil fuels) energy generation facilities, and new waste disposal technology are factors that will determine the rate of change in air quality. Ambient air quality is not expected to degrade beyond attainment standards where it is currently better than those standards or where PSD areas are located. The effects of all emissions on areas presently classified as nonattainment will be reduced over time so that attainment standards will be met. Controls or offsets may be applied to emission sources to meet these standards.

CONCLUSION: The overall cumulative impacts will be moderate.

(4) Biological Environment

(a) Impacts on plankton

The impact factors and effects for plankton are discussed in Section IV.B.4.a.(4)(a).

Impact analysis

The proposal is expected to result in the drilling of over 2800 wells and the emplacement of up to 133 platforms throughout the area. This would result in the dumping of over 600,000 barrels of drill muds, around 360,000 barrels of cuttings, and as much as 900 million barrels of formation waters. This will take place over a period of 30 to 35 years. The extent of the waters into which this activity will take place will preclude all by localized and temporary impacts in the immediate vicinity of drill rigs and platforms.

The production phase can impact phytoplankton through the disposal of formation waters which contain the soluble fractions of crude oil at an average concentration of 30 mg/l and relict sea water with trace amounts of certain heavy metals. As mentioned above, the resultant receiving water concentration of petroleum hydrocarbons is difficult to assess, but if we assume instantaneous mixing into one cubic meter of sea water, the concentration would be approximately 30 micrograms per liter. Gordon and Prouse (1973) have observed stimulation of phytoplankton photosynthesis by Venezuelan crude in concentrations of 30 to 50 mg/l with inhibitions at higher concentrations in studies conducted off Nova.

The exploratory phase will have a localized effect on the phytoplankton in the vicinity of each exploratory well by the presence of turbidity plumes created by the disposal of drill muds associated with the cuttings. If we assume that these operations create a plume 20 m wide and 800 m long (plumes of this approximate maximum size have been observed in the Gulf of Mexico) then the euphotic zone will be reduced under 16 ha of sea surface for the duration of drilling (approximately 15 days). The residence time for any single phytoplankton within this reduced euphotic zone would depend on the vertical and horizontal transport to which it is subjected.

The activities associated with oil and gas leasing in the central Gulf would be temporary and localized. Any adverse effects on plankton, resulting from the proposed action, would be localized, with populations expected to recover quickly.

CONCLUSION: The level of impact on plankton is expected to be very low.

CUMULATIVE IMPACTS: Gulf plankton populations are related to overall Gulf water quality. Planktonic populations may be affected by discharges from drilling operations, rivers and upland runoff, and shipping activities. Discharges which affect temperature, salinity, turbidity, nutrient, and chemical levels of the water would impact plankton. Due to the circulation and mixing patterns of the Gulf, impacts on plankton from such discharges would be localized. Localized impacts are expected to be short-term due to the short life span of plankton. The incremental affect of the proposed action on plankton will not be significant.

CONCLUSION: The cumulative level of impact on plankton is expected to be very low.

(b) Impacts on Benthos

Refer to Section IV.B.4.a.(4)(b) for a discussion of the impact factors and the direct and indirect effects of the proposed action on the benthos.

In addition, live bottom areas in the Central Gulf would experience similar impacts from the proposed action.

Impact Analysis

The proposed action will result in a predicted 1,246 exploratory wells, 1,596 development wells, and 133 platforms in the Central Gulf. Based on this scenario, the discharge of an estimated 0.01-0.896 billion bbls of formation waters, 12.9 million bbls of drilling muds, and 1.45 million cu. yds. of drill cuttings may be expected to result from the proposed action. Pipeline related activities would result in the disturbance of up to 4.5 million cu. yds. of sediment. For a discussion of the effects of these discharges on the benthos, refer to Section IV.B.4.a.(4)(b).

Leasing activity at topographic features and offshore Mobile, Alabama, where live bottom areas can be expected has increased steadily during the past years. Assuming that only one of these events occurs at a topographic feature, the impact to the biota would be severe and perhaps permanent. An activity occurring at a significant live bottom area would also be severe.

Anchoring is inevitably associated with oil and gas activity. Supply boats, pipeline barges, and drilling rigs all may require anchoring. Topographic features are convenient anchoring spots due to their relief off the seafloor. Anchoring from oil and gas activities would cause severe damage to the biota of topographic features. Anchoring at a live bottom area would also cause severe damage.

The probability of a subsurface oil spill occurring in proximity to a topographic feature or live bottom area is low. Effects to the benthos are not expected to be significant from an oil spill.

CONCLUSION: The level of impact to the benthos is expected to be low; however, in those areas containing topographic highs and/or live bottom areas, the level of impact would be very high.

CUMULATIVE IMPACTS: The major factors contributing to the impact of the benthic environment are anchoring, trawling, dredging, and ocean dumping. Bottom disturbance of soft bottom areas is frequent but usually short-term. Anchoring, trawling, and dredging cause disruption of the substrate and turbidity. Ocean disposal of dredged material smothers the benthos. These areas are usually recolonized quickly, however, often by different benthic species. These same factors at hard bottom areas can be devastating. Destruction of the benthos is long-term at hard bottom areas. Significant impact has occurred at topographic features due to anchoring.

Oil and gas operations have been significant and are increasing around the topographic features of the Central Gulf. Past operations near topographic features have not had a significant effect on the benthic environment due to the implementation of protective lease stipulations.

CONCLUSION: The cumulative level of impact on the benthos is expected to be very high.

(c) Impacts on Fish Resources

Refer to Section IV.B.4.a.(4)(c) for a discussion of the impact factors and the direct and indirect effects of the proposed action on fish resources.

Impact analysis

Three large spills (1,000 bbls or greater) are assumed to occur in the Central Gulf of Mexico. A large spill contacting with open bays containing finfish and shellfish nursery and/or spawning grounds could cause severe, medium-term (1-3 years duration) effects on fish resources. In addition, a number of smaller spills (less than 1,000 bbls) are assumed. These spills are expected to result in localized short-term effects on fish resources.

Seven hundred fifty miles of pipelines are expected to result from the proposed action in the Central Gulf of Mexico. Pipeline placement activities would have localized impacts on fish resources including destruction of benthic species and fishery habitat and increased turbidity. The impact of pipeline placement is expected to be low.

CONCLUSION: The level of expected impact on fish resources is estimated to be moderate.

CUMULATIVE IMPACTS: Cumulative impacts on fish resources include the impact of the proposed action and impacts related to prior OCS sales and major non-OCS impact producing factors.

Thirty-three large spills (1,000 bbls or greater) are assumed to occur in the Central Gulf of Mexico as a result of Federal OCS and other activities under the cumulative scenario. A large spill contacting open bay areas would result in severe medium-term (1-3 years in duration) consequences on invertebrate and vertebrate fisheries and deter fishing. In addition, a number of smaller spills (less than 1,000 bbls) are assumed. These spills are expected to result in localized short-term effects on fish resources.

In addition to the 750 miles of pipelines projected for the Central Gulf of Mexico from the proposed action, another 1,100 miles are expected to result from lease sales held in the recent past. The impact of pipeline placement is expected to be low.

CONCLUSION: The impacts resulting from the proposed action, plus the effects of these other factors, added to the widely varying baseline conditions resulting from natural environmental factors, may result in a high cumulative impact on fish resources.

(d) Impacts on Marine Mammals

The impact factors and effects on marine mammals in the Central Gulf of Mexico planning area are the same as those discussed for the Western planning area, Section IV.B.4.a.(4)(d).

Of the marine mammals discussed in Section III.B.1.b.(4)., the bottlenose dolphin is probably the non-endangered marine mammal more vulnerable to

OCS-related oil/gas activities based on their population and nearshore habitat (Fritts and Reynolds, 1981; Schmidly, 1981).

Impact analysis

Three large oil spills (1,000 bbls or greater) and several smaller spills are assumed for this analysis. The probability of a spill occurring is very high (about 93%). Recent studies by Geraci and St. Aubin (1985) have indicated dolphins can detect and will avoid oil slicks, and surface contact with oil did not affect their skin. However, the effects of vapor inhalation and ingestion of food contaminated with oil has not been determined. It is estimated that the level of impact to marine mammals from oil spills would be low.

As a result of the proposed action, vessel traffic is estimated to increase about 3%. The level of impact to marine mammals from OCS-related vessel collisions is estimated to be very low.

About 2,842 wells will be drilled, and some seismic exploration will be required over the assumed 20-30 year period of the proposed action. The effect of this disturbance to marine mammals is unknown; however, because it is usually short-term and fairly localized, it is unlikely to cause a major impact on marine mammals.

CONCLUSION: The level of expected impact on marine mammals as a result of the proposed action is estimated to be low.

CUMULATIVE IMPACTS: In addition to the impacts discussed previously for the proposed action, impacts from existing Federal OCS oil/gas leases and activities; existing oil/gas leases and activities in Texas tidelands; tankering of petroleum products and foreign crude oil; and other commercial, military, and recreational offshore and nearshore activities should be considered as cumulative impacts. Other impacts that are unrelated to OCS activities but could contribute to a cumulative impact on marine mammals include: sound produced by commercial, military, and recreational vessels and aircraft and by commercial and military sonar; natural oil seeps, bilge cleaning, and foreign oil spills; commercial and subsistence hunting of marine mammals; entrapment, injury, and morality in fishing gear and underwater cables; and ocean disposal of chemicals, radioactive wastes, and munitions.

Thirty-three large spills (1,000 bbls or greater) and several smaller spills are assumed for this analysis. Deepwater oil/gas exploration and development on the continental slope could affect sperm whales which feed on squid in deepwater areas. The cumulative impact of these factors on the marine mammal population is estimated to be moderate.

OCS-related vessel traffic is about 5% of the existing commercial, military, and recreational vessel traffic in the offshore areas inhabited by marine mammals. It is estimated that currently 270,000 vessel trips of all types occur. Seismic exploration will occur on additional lease blocks, and sound will be generated by about 3,584 offshore platforms and numerous supply/crew boats and aircraft. The majority of these disturbances and noises are generally localized around the source and fairly short-term in duration. The cumulative impact from these disturbances and noises on marine mammals is estimated to be low.

CONCLUSION: As a result of the proposed action and other activities, the overall cumulative impact on marine mammals is estimated to be low.

(e) Impacts on Coastal and Marine Birds

The impact factors and effects on coastal and marine birds are the same as those discussed for the Western planning area, Section IV.B.4.a.(4)(e).

Impact analysis

Three large spills (1,000 bbls or greater) and several smaller spills are assumed for this analysis. Many of the coastal and marine birds which are susceptible to oil spills, are migratory and could be exposed to oil spills during their overwintering period (October-March).

It is estimated that the level of impact to coastal and marine birds from OCS-related oil spills would be moderate.

Disturbance of coastal and marine birds' nesting and feeding habitat from onshore construction and associated noise from air and vessel traffic could result in a reduction or elimination of birds that use the habitat for feeding or nesting. Dredging, emplacement of pipelines, and the construction of roads could change water flows that may result in the damage or destruction of wetland nesting areas.

Impacts to coastal and marine bird habitats may result from construction of an estimated up to seven pipelines and up to five supply bases in the Central Gulf coastal area. The estimated pipeline landfalls and support facilities will probably be located in developed onshore areas, and it is unlikely that they will affect coastal and marine nesting/feeding habitat.

It is estimated that the level of impact to coastal and marine birds from OCS-related air and vessel traffic and onshore construction would be moderate.

CONCLUSION: The level of expected impact on coastal and marine birds as a result of the proposed action is estimated to be moderate.

CUMULATIVE IMPACTS: In addition to the impacts discussed previously for the proposed action, other impacts would result from existing Federal OCS oil/gas leases and activities, and existing oil/gas leases and activities in State tidelands. Impacts which are not related to OCS activities but could contribute to the major cumulative impact on coastal and marine birds would include the loss of nesting and feeding habitat to commercial, military, recreation, and residential construction; potential construction of offshore oil ports or deepwater marine terminals; dredging and draining of wetland areas along migratory flyways and in coastal feeding and overwintering areas; high levels of oil/tar balls from natural seeps, municipal runoff, bilge cleaning, and foreign crude oil spills; entanglement in commercial and recreation fishing gear; collision with electric lines and towers; and coastal storms and hurricanes cause flooding and destruction of nesting areas resulting in bird losses. Agricultural runoff and industrial organic chemicals wastes could cause direct mortality or indirectly cause the loss of food sources for bird species.

Thirty-three oil spills (1,000 bbls or greater) and a number of smaller spills are assumed for this analysis. The expected level of cumulative impact on coastal and marine birds due to these oil spills is estimated to be high.

Disturbance from OCS-related aircraft, boat, and vessel traffic in the vicinity of bird nesting and feeding areas is not expected to increase above current levels. About 90% of the aircraft and vessel traffic in this area is non-OCS-related.

Up to 18 new pipeline landfalls, up to 6 gas processing plants, up to 12 supply bases, and 17 other shore facilities may be required. Cumulative impacts from OCS-related onshore development and support facilities are expected to have a moderate impact.

CONCLUSION: As a result of the proposed action and other activities described above, the overall cumulative impact on coastal and marine birds in the Central Gulf is expected to be high.

(f) Impacts on Endangered and Threatened Species

The impact factors and effects on endangered species are the same as those discussed for the Western planning area, Section IV.B.4.a.(4)(f).

(i) Sea turtles

Loggerhead, green, leatherback, Kemp's ridley, and hawksbill turtles occur in the proposed sale area. Sporadic loggerhead nesting has occurred on Horn and Ship Islands off Mississippi and the Chandeleur Islands off Louisiana. No green, leatherback, ridley, or hawksbill turtle nesting has been reported. Leatherback, loggerhead, and Kemp's ridley turtles forage off the Louisiana coast.

About 70 miles (about 25% of the exposed coastline) of the coastline is suitable habitat for sea turtle nesting. Sporadic (primarily loggerhead) nesting occurs in this area.

Three large oil spills (1,000 bbls or greater) and several smaller spills are assumed for this analysis. The probability of a spill occurring is very high (about 93%). Only a moderate portion of the nesting beaches are exposed to potential oil spills, and these beaches experience very light nesting; therefore, it is unlikely that OCS-related oil spills will affect turtle nesting. However, recent studies have indicated that sea turtles can be severely affected by floating oil/tar balls. It is estimated that the level of impact to sea turtles from oil spills would be moderate.

As a result of the proposed action, OCS-related vessel traffic is estimated to increase about 2%. The incidence of vessel collisions with sea turtles is unknown; however, as no injuries or mortalities have been reported or documented, it is estimated the level of impact from OCS-related vessel collisions is very low.

Up to seven oil/gas pipeline landfalls are estimated. One of these pipelines could cross a nesting beach. If these pipelines are emplaced during June-September (nesting period), severe mortality of eggs or juvenile turtles could occur. If pipeline emplacement occurs other than during nesting season, the potential impacts would be negligible.

CONCLUSION: The level of expected impact on sea turtles as a result of the proposed action is estimated to be moderate.

CUMULATIVE IMPACTS: In addition to the impacts discussed previously for the proposed action, impacts from existing Federal OCS oil/gas leases and activities; existing oil/gas leases and activities in State tidelands; tankering of petroleum products and foreign crude oil; and other commercial, military, and recreational offshore and coastal activities should be considered as cumulative impacts.

Impacts that are unrelated to OCS activities but contribute to major cumulative impacts on sea turtles include: the loss of nesting beaches to commercial, recreational, and residential development along the Central coastal area beaches; high mortality caused by commercial trawling; natural and man-induced predation of turtles and eggs on nesting beaches throughout the Gulf and Caribbean regions; oil/tar balls from natural seeps, bilge cleaning, and tanker spills; compaction of beach areas by vehicles and beach cleaning equipment; incidental capture by commercial longline fishing gear and entanglement in crab pot lines; dumping of contaminated wastes and plastic materials into coastal waters; and collision with commercial and recreational vessels. In 1984, about 489 turtle strandings were reported for the Gulf of Mexico (USDC, NMFS, 1984).

Thirty-three large spills (1,000 bbls or greater) and several smaller spills are assumed for this analysis. An unknown number of oil spills could result from oil development in the State tidelands. Also, oil/tar balls from natural seeps, bilge cleaning, and foreign oil spills impact the Central coastal area. The cumulative impact of oil spill contacts and other oil contamination is expected to result in a high level of impact on marine turtles.

Collisions of OCS-related support vessels with sea turtles could occur in Central coastal areas; the incidence of collisions has not been documented and is believed to be infrequent. OCS-related vessel traffic is about 5% of the commercial and recreational vessel traffic.

Impacts to sea turtles from OCS-related coastal development and support facilities are not expected as the majority of these facilities are already established. Up to 18 new pipeline landfalls, up to 6 gas processing facilities, and up to 12 service bases may be required; these are unlikely to impact sea turtle nesting/feeding areas. The cumulative impact of OCS-related facilities are expected to result in a low level of impact on marine turtles.

CONCLUSION: As a result of the proposed action and other activities, the overall cumulative impact on sea turtles in the Central Gulf is estimated to be high.

(ii) Brown pelicans

Impact analysis: There are four nesting sites of brown pelicans along the Central Gulf coast. One site is located in the vicinity of North Island, Louisiana, with about 1,000 birds; a small site is located just south of the mouth of the Pearl River; a site is located in the vicinity of Queen Bess Island, Louisiana, with about 1,000 birds; and a site is located on Gaillard Island (near Theodore) in Mobile Bay, Alabama.

Three large oil spills (1,000 bbls or greater) and several smaller spills are assumed for this analysis. The probability of a spill occurring is very high (about 93%). A small portion of the central coastal area is utilized by brown pelicans for nesting, and a larger nearshore area is used for feeding. It is estimated that the level of impact to brown pelicans from oil spills would be moderate.

As a result of the proposed action, OCS-related air and vessel traffic is estimated to increase about 3% between onshore support bases and offshore platforms. This increased noise disturbance is estimated to have a low level of impact on brown pelican nesting areas.

Coastal onshore facility construction of up to seven pipeline landfalls and up to five onshore support bases are not likely to be constructed near brown pelican nesting areas. It is estimated that the level of impact to brown pelicans from onshore construction would be low.

CONCLUSION: The level of expected impact on brown pelicans as a result of the proposed action is estimated to be moderate.

CUMULATIVE IMPACTS: In addition to the impacts discussed previously for the proposed action, impacts from existing Federal OCS oil/gas leases and activities; existing oil/gas leases and activities in State tidelands; tankering of petroleum products and foreign crude oil; and other commercial, military, and recreational coastal activities should be considered as cumulative impacts.

Impacts that are unrelated to OCS activities but contribute to the major cumulative impact on brown pelicans would include the loss of habitat to commercial, military, recreational, and residential development in the coastal zone; dredging and drainage of wetland and coastal feeding areas; high levels of oil and organic chemical contamination of coastal water and food sources by agricultural runoff and industrial wastes; the disturbance from aircraft, boat, and vessel traffic in nesting and feeding areas; entanglement in commercial and recreational fishing gear; collision with power lines and towers; and coastal storms and hurricanes which cause flooding and destruction of nesting areas.

Thirty-three large spills (1,000 bbls or greater) and several smaller spills are assumed for this analysis. In addition, oil/tar balls from natural seeps, bilge cleaning, and foreign oil spills could also impact brown pelicans. The expected cumulative impact of oil spills and other oil contamination on brown pelicans is estimated to be high.

Disturbance from aircraft, boat, and vessel traffic in the vicinity of pelican nesting and feeding areas along the Central Gulf coast is not likely to increase above current levels as a result of OCS oil/gas activities. About 90% of the aircraft, boat, and vessel traffic in this area is non-OCS-related, such as: commercial tanker/cargo vessels; commercial and recreational fishermen; intracoastal tug and barge traffic; maintenance dredging; and commercial and private aircraft.

Impacts to brown pelicans from OCS-related onshore development and support facilities are not expected to increase much above current levels to handle cumulative OCS oil/gas resources. The majority of OCS-related onshore facilities are already established in the Central Gulf.

CONCLUSION: As a result of the proposed action and other activities, the overall cumulative impact on brown pelicans in the Central Gulf is expected to be high.

(g) Impacts on Seagrasses and Wetlands

The impact factors and effects on seagrasses and wetlands are the same as those discussed for the Western planning area, Section IV.B.4.a.(4)(g).

(i) Seagrasses

Impact analysis: There are about 579 acres of unexposed and 54,289 acres of exposed seagrass areas in the Central Gulf of Mexico coastal area. Oil spills which contact seagrasses in intertidal areas can result in extensive and long-term (1-3 years) damage. However, as most seagrass areas are subtidal, oil spills usually only contact and damage those areas which are exposed to tidal influences.

Three large oil spills (1,000 bbls or greater) and several smaller spills are assumed for this analysis. The probability of a spill occurring is very high (about 93%). A major portion of the seagrass areas would be exposed to potential offshore oil spills; it is estimated that the level of impact to seagrasses from oil spills would be moderate.

Up to seven oil/gas pipeline landfalls, no new navigation canals, and an undetermined amount of maintenance dredging of existing navigation canals are estimated. For this analysis the assumption is made that the emplacement of one mile of pipeline canal or one mile of navigation channel dredging could damage or destroy up to six acres of seagrasses.

It is estimated that up to 126 acres of seagrasses could be damaged or destroyed in the vicinity of the pipeline landfalls and maintenance dredging. This represents a loss of up to 0.2% of the total seagrasses. This would indicate a low level of impact to seagrasses.

CONCLUSION: The level of expected impact on coastal seagrasses as a result of the proposed action is estimated to be moderate.

CUMULATIVE IMPACTS: In addition to the impacts described for the proposed action, impacts from existing Federal OCS oil/gas leases and activities; existing oil/gas leases and activities in State tidelands; barging and tankering of foreign crude oil and petroleum products; canalization and maintenance dredging; commercial and recreational trawling; commercial, military, and recreation boat and vessel traffic; agricultural, industrial, and municipal effluents; and coastal storms and hurricanes all impact coastal seagrass beds to some extent. Few of these impact producing factors can be quantified.

A total of 33 large oil spills (1,000 bbls or greater) and several smaller spills are assumed for this analysis. The probability of a spill occurring is very high (about 99+%). There is a potential for some of these oil spills to occur nearshore or inshore from barges, tankers, or pipelines, which could cause extensive damage to intertidal seagrasses in the vicinity of the spill site.

A major portion of the seagrass areas could be exposed to potential oil spills. It is estimated that the cumulative level of impact to seagrasses from oil spills would be high.

Most of the dredging for pipeline canals and navigational channels in the coastal waters, where seagrasses occur, damage or destroy some seagrasses. The extent of damage depends on several factors, such as: location, substrate, seagrass species, wave action, etc. Maintenance dredging of inlets and navigational channels is an ongoing process in the coastal area. Where pipeline canals and navigational channels intersect the coastline, barrier islands, or estuarine areas, there are usually seagrass areas that could be damaged.

Eighteen new pipeline landfalls, up to 12 new onshore facilities, 1 new navigation channel, and an undetermined amount of maintenance dredging of existing navigation channels are estimated. It is estimated that up to 324 acres of seagrasses could be damaged or destroyed in the vicinity of the pipeline landfalls and this dredging activity. This represents a loss of up to 0.5% of the total seagrasses. This would indicate a moderate cumulative level of impact to seagrasses from OCS oil-/gas-related activities.

Although other construction activities in the coastal area may not directly impact seagrasses, there may be an indirect impact of sedimentation and increased effluents of organic chemicals which may damage or destroy seagrasses in the coastal area. Trawling, vessel traffic, and coastal storms cause wave action, water turbulence, and turbidity which can damage seagrasses. The cumulative impact of these activities on seagrasses is estimated to be moderate.

CONCLUSION: The overall cumulative level of impact to seagrasses is estimated to be high.

(ii) Wetlands

Impact analysis: There are about 3,393,695 acres of non-forested wetlands. The wetlands exposed to potential oil spills consist of about 1,776 miles of coastal wetlands (about 80% of the coastal wetlands). For this analysis, three large oil spills (1,000 bbls or greater) and several smaller spills are assumed to occur. The major portion of the coastal wetlands are exposed to potential oil spills; it is estimated that the level of impact to wetlands from oil spills could be high.

Up to seven oil/gas pipeline landfalls, up to five onshore facilities, no new navigation channels, and an undetermined amount of maintenance dredging of existing navigation channels are estimated.

For this analysis the assumption is made that onshore emplacement of one mile of pipeline or one mile of navigation channel could damage or destroy up to 12 acres of coastal wetlands. Estimates of the average acreage used for new onshore infrastructure/support facilities considered in the analysis are as follows: exploratory drilling service base - 15 acres; development/production service base - 75 acres; pipeline installation service base - 5 acres; pipe coating yard - 150 acres; pipelines per mile - 12 acres; platform fabrication yard - 400 acres; gas processing plant - 75 acres; and marine terminal - 30 acres.

It is estimated that up to 1,207 acres of coastal wetlands could be damaged or destroyed as a result of the estimated pipeline emplacements, onshore facility construction, and maintenance dredging. This represents a loss of up to 0.04% of the total wetlands and would indicate a low level of impact to wetlands.

CONCLUSION: The level of expected impact on coastal wetlands as a result of the proposed action is estimated to be high.

CUMULATIVE IMPACTS: In addition to the impacts described for the proposed action, impacts from existing Federal OCS oil/gas leases and activities; existing oil/gas activities in State tidelands; barging and tankering of foreign crude oil and petroleum products; canalization and maintenance dredging; commercial, military, and recreational boat and vessel traffic; residential, urban, and industrial development; agricultural, industrial, and municipal effluents; and coastal storms and hurricanes all impact coastal wetlands to some extent. Few of these impact producing factors can be quantified. Submergence increases the depth, periodicity, and, in some cases, duration of given levels of salinity. Development replaces the coastal wetlands with upland habitats. Wave erosion replaces the non-forested emergent wetlands with open water.

A total of 33 large oil spills (1,000 bbls or greater) and several smaller spills are assumed for this analysis. The probability of a spill occurring is very high (about 99+%). There is a potential for some of these oil spills to occur nearshore or inshore from barges, tankers, or pipelines which could cause extensive damage to coastal wetlands in the vicinity of an oil spill site. A major portion of the coastal wetlands could be exposed to a potential oil spill incident. It is estimated that the cumulative level of impact to coastal wetlands from oil spills would be high.

Most of the pipeline canals, navigational channels maintenance dredging activities, and construction of onshore facilities in coastal areas, where wetlands occur, damage or destroy some wetlands.

Up to 18 new pipeline landfalls, 1 new navigation channel, up to 12 new onshore facilities, and an undetermined amount of maintenance dredging of existing navigation channels are estimated. It is estimated that up to 4,938 acres of coastal wetlands could be damaged or destroyed as a result of these activities. This represents a loss of up to 0.2% of the total wetlands and would indicate a moderate level of impact to wetlands.

Other construction and development activities in the coastal area may have direct and indirect impacts on wetlands. A direct loss of wetlands by dredging and draining converts wetlands to uplands.

CONCLUSION: The overall cumulative level of impact to wetlands is estimated to be high.

(h) Impacts to Areas of Special Concern

Refer to Section IV.B.4.a.(4)(h) for a discussion of the impact factors associated with the proposed action.

(i) Direct and indirect impacts

The topographic features and live bottom areas are areas of special concern in the Central Gulf of Mexico. Effects resulting from the impact factors would be severe and long-lasting. These effects are discussed in Impacts on Benthos, Section IV.B.5.a.(4)(b).

(ii) Impact analysis

The offshore resources of concern in the Central Gulf are live bottom areas (a small area of the extreme northeastern Central Gulf sale area) and the coral and associated communities associated with topographic features generally found along the shelf break of the Central Gulf.

Potential causes of adverse impacts to those resources from the proposed action are oil spills, 3 spills are considered likely in the areas, mechanical damage to organisms (and their habitat) due to drilling, anchors, pipeline and platform emplacement, smothering by drilling fluids or cuttings, and blowouts; and toxicity to organisms of drilling fluids components.

These large oil spills are assumed in the Central Gulf. This oil spill may occur from a seafloor source (pipeline accident, oil well blowout) or sea level source (tanker accident, leaks on a platform, etc.). Oil may be transported downward to some extent in the water column due to normal circulation processes but should not be transported below the pycnocline under normal conditions. Oil spilled from a seafloor source or spilled at the surface under certain circumstance, such as severe storms, may be entrained and transported for great distances in subsurface currents.

Most live bottom areas and all the banks of the Central Gulf are, in general, not expected to be impacted from surface oil spills because of the water depth (i.e., 10 m or greater) at which these areas are found; although not extensively studied, it appears that the deepest oil driven into the water column from a surface spill is 6 m, and even there it is found only in concentrations several orders of magnitude lower than that shown to have an effect on marine organisms (Lange, 1985; McAuliffe et. al., 1975 and 1981). Seagrass beds, which occur in the Central Gulf in water depths less than 6 m, could be impacted by a surface spill.

The biota of the topographic highs and low relief live bottoms of the Central gulf could be significantly impcted by a seafloor oil spill. The potential for a subsurface spill in proximity to the banks exists. The effluents could impinge directly upon the edge of the bank. Impacts could then be serious to the local biota. Destruction of the biota of such areas may have severe and long-lasting deleterious consequences on the specific commercial and recreational fisheries habitats affected, such as loss of habitat, loss of species (including prey species), destruction of hard substrate, and change in sediment characteristics, all of which may result in the reduction or loss of one or more fisheries. These areas also have intrinsic biological, ecological, and aesthetic values of their own which would be lost by such activities.
All the offshore resources of concern mentioned above would be at risk from drilling muds and cuttings discharges during drilling operations and to mechanical damage from construction activities. Impacts from these activities are generally quite localized in extent. However, the damage caused by these activities to unique and productive communities, such as coral reefs and live bottoms, could be quite severe.

Considerable mechanical damage could be inflicted upon the bottom by normal and routine oil and gas operations. The drilling operation itself disturbs some small areas. Anchors from support boats and ships, floating drilling units, and pipeline laying vessels do a great deal of damage to live bottoms and corals. The area actually affected will depend on depth of water, length of chain, size of chain, wind, and current, but severe damage to sensitive communities can occur within the area.

Blowouts can present a serious threat (due to burying by resuspended sediments) to important biological resources if one were to occur near a coral or live bottom area. Gas well blowouts generally pose far less environmental risk than do oil spills, resulting only in very high concentrations of suspended sediments and increased levels of gas in the water column very near the source of the blowout. To the extent that oil or condensate is present in the reservoir, some liquid hydrocarbons may also be injected into the water column. The suspended sediments may be carried some distance by currents, but the bulk of the sediments are redeposited within a few thousand meters of the blowout site.

A large blowout occurring near a biologically sensitive area would have severe environmental consequences. Large amounts of the sediment resuspended by the blowout could smother the coral community causing mortality. Recolonization would be slow if at all.

One other source of discharges into the Gulf from routine oil and gas operations, which is sometimes cited as a potential hazard to biological communities, is produced water. The preponderance of the evidence indicates that such discharges are not an environmental hazard. The proposal could result in the release of up to 900 million barrels of produced water, but only a small fraction would probably be released near any given sensitive area.

CONCLUSION: The level of impact to areas of special concern is expected to be very high.

CUMULATIVE IMPACTS: The cumulative impacts to areas of special concern are discussed in Section IV.B.5.a.(4)(b).

CONCLUSION: The cumulative level of impact to areas of special concern is expected to be very high.

(i) Impacts to marine sanctuaries

There are no designated marine sanctuaries in the Central Gulf of Mexico.

(5) Socioeconomic Environment

(a) Impacts on employment and demographic conditions

The impact factors and effects for employment and demographic conditions are discussed in Section IV.B.4.a.(5)(a).

Impact analysis

Employment projections with the proposed lease sales are based on the well drilling, platform, and pipeline requirements estimated for the proposed actions. Employment projections are also made on the basis of no future sales after 1986 for the purpose of comparative analysis.

The scheduled Central Gulf of Mexico lease sales of the proposed 5-year schedule are expected to provide employment to Central Gulf residents throughout the 1988-2016 period. Employment generated from the proposed lease sales is expected to peak in 1997 at about 15,500 direct, secondary, and tertiary jobs. However, none of the employment associated with oil and gas industry activities from the proposed Central Gulf lease sales represent new resident employment. Alternately, employment generated by the proposed action will allow a continuation of some existing oil-/gas-related jobs.

CONCLUSION: The impact of the proposed 5-year schedule on all Central Gulf coastal subareas is expected to be very low based on the absence of new resident activity.

CUMULATIVE IMPACTS: The cumulative impact analysis is based on the expectations of the proposed actions in the Gulf of Mexico, as well as the projected effects of past leasing and other existing employment producing activities (in all industries). Total employment, income, and population in the coastal region based on this analysis is expected to grow throughout the next 10 years at an average rate of 1% annually in the Central Gulf and 1% annually, even without additional OCS oil and gas lease sales. The proposed actions will have a negligible effect on these total average annual growth rates since these sales are expected to result in much less than 1% growths in economic activity in each affected coastal subarea, as previously discussed in this report.

CONCLUSION: The proposed action will have a negligible effect on the annual growth rate of total employment, income, and population in the Central Gulf coastal region. The cumulative effect will be an average annual growth rate of about 1%, which is considered a low impact level.

(b) Impacts on coastal land use

Refer to Section IV.B.4.a.(5)(b) for a discussion of impact factors and the direct and indirect effects of the proposed action on coastal land use.

Impact analysis

Onshore support and processing services for offshore drilling and production under the proposed action are estimated to be provided almost entirely from existing facilities in Louisiana, Mississippi, Alabama, and Texas. The Central and Western coastal areas have a highly developed system of onshore support and processing infrastructure serving oil and gas development in the OCS, as well as in State offshore waters, wetlands, and upland areas. Much of this infrastructure has unused or readily expandable capacity.

New facilities estimated under the proposed action include possibly five service bases supporting development/production activity and up to seven pipeline landfalls with up to 750 miles of onshore routing. Potential locations for the service bases are the existing port/industrial areas located in the Long Beach-Biloxi area (Harrison County, Mississippi), Pascagoula area (Jackson County, Mississippi), and the Mobile-Bayou LaBatre area (Mobile County, Alabama). Potential locations for the pipeline landfalls and onshore routes include Cameron, Vermilion, Iberia, St. Mary, Terrebonne, Lafourche, Jefferson, Plaquemines, and St. Bernard Parishes in Louisiana (not more than one pipeline landfall is assumed for any of these parishes).

CONCLUSION: The expected level of impact on State and local land use management policies will be very low.

CUMULATIVE IMPACTS: Cumulative impacts on State and local land use management include the impacts of the proposed action as discussed above, plus impacts related to prior OCS sales and to major non-OCS impact producing factors affecting the coastal area.

Estimated facilities construction resulting from prior OCS sales and the proposed action are as follows: 12 service bases; 3 pipe coating yards; 18 pipeline landfalls; 5 platform fabrication yards; and 12 gas processing plants.

Non-OCS factors include all those activities which can cause potentially major impacts to, or conflicts with, the policies, objectives, and regulatory requirements/guidelines of local land use plans and CZM programs. Broadly stated, these activities include residential, commercial, industrial, agricultural, institutional, recreational, energy, transportation facilities, and other development.

CONCLUSION: The expected level of impact on state and local land use management policies would be low.

(c) Impacts on water supply

Refer to Section IV.B.4.a.(5)(c) for a discussion of impact factors and direct and indirect effects of the proposed action on water supply.

Impact analysis

Increased demands on coastal water resources in the Central Gulf may be expected to occur as a result of increased OCS activities in this area. Changes in population and increased industrial activities may result in association with expanded OCS support activities resulting from the proposal. Based on MMS estimates for the Central Gulf, an estimated water consumption of approximately 3.0 billion gallons of water will be needed for offshore drilling alone. Supply bases could use as much as 5.2-8.2 million gallons of freshwater/rig-platform/year with 460,000 gallons being potable. Additional water uses would come from onshore support activities associated with gas processing, refining, and platform fabrication. Projected peak new population growth associated with the proposed action is estimated to be minimal and distributed over 20 parishes and 6 counties, thus resulting in insignificant increases in local water usage and very low impacts as a result of population increases associated with the proposed action. Temporary, moderate impacts of a localized nature could be experienced, particularly in areas currently experiencing water supply shortages, as a result of increased water usage by onshore support operations.

CONCLUSION: Any stress would only be of a temporary nature due to the availability of raw water in this region; therefore, the expected impacts are very low on regional water supplies.

CUMULATIVE IMPACTS: As a result of prior OCS-related activities and the proposed action, the addition of up to 12 new service bases, 5 platform fabrication yards, 12 new gas processing plants, 293 platforms, 3,406 exploration/delineation wells, and 3,266 production wells will impact area water supplies as a result of prior OCS-related activities. These impacts to water supply will result in increased burdens on existing water resources. Mitigation of water supply-related impacts will require prudent site selection of these proposed onshore support facilities in areas known to possess ample surface and groundwater supplies at present, and with water resource conservation and development plans for the future.

Although Louisiana has one of the most abundant supplies of surface and groundwater in the United States, recent studies conducted by the State point to a growing awareness that economic growth and human activities both above and below the ground are degrading the quality of its water resources. These factors, coupled with the natural processes of erosion, subsidence, and the predicted sea level rise, currently threaten the future potential of these resources. In general, it was thought that the supplies of this area far exceeded the demands; however, as is the case with many of the coastal parishes, adequate water supplies do not always abound in those areas of need.

CONCLUSION: The OCS-generated cumulative demands are expected to have a low impact on the water supply of the potentially affected area. However, the overall cumulative impact, which includes the effect of non-OCS population and industrial growth, is expected to be high.

(d) Impacts on commercial fisheries

Refer to Section IV.B.4.a.(5)(d) for a discussion of the impact factors and direct and indirect effect of the proposed action on commercial fisheries.

Impact analysis

From 1977-1980 approximately 1.5 billion lbs/yr of finfish and shellfish with a dockside value of $281.1 million were caught in the Central Gulf of Mexico. One hundred thirty-three platforms are expected under the proposed action, eliminating less than 0.1% (399-665 acres) of the trawling area. Three large spills (1,000 bbls or greater) are assumed for this area. These spills could cause severe, medium-term (1-3 years duration) effects on fisheries if contact was made with shellfish nurseries or spawning grounds. In addition, a number of smaller spills (less than 1,000 bbls) are assumed. These spills are expected to result in localized short-term effects on fish resources.

CONCLUSION: The level of expected impact on the commercial fishing industry is estimated to be moderate.

CUMULATIVE IMPACTS: Cumulative impacts on commercial fisheries include the impact of the proposed action and impacts related to prior OCS sales and major non-OCS impact producing factors.

In addition to the 133 platforms projected for the Central Gulf of Mexico from the proposed action, another 140 are expected to result from lease sales held in the recent past. The total area lost to trawling (819-1,365 acres) would still represent less than 0.1% of the trawling area.

Thirty-three large spills (1,000 bbls or greater) are assumed to occur as a result on Federal OCS and other activities under the cumulative scenario. A large spill contacting open bay areas could result in severe, medium-term (1-3 years in duration) consequences on invertebrate and vertebrate fisheries and deter fishing. In addition, a number of smaller spills (less than 1,000 bbls) are assumed with open bays in this area. These spills are expected to result in localized short-term effects on fish resources.

Within parts of the Central Gulf, no size or count limits are imposed during certain shrimp seasons, causing overfishing in these areas. Also, shrimpers taking large numbers of fishes in the groundfish complex (croakers being an example of this group) may be contributing to reductions in the numbers of these species. Space use conflicts can result from different forms of commercial operations and between commercial and recreational fisheries. In the Central Gulf, for example, crab trappings and shrimping operations often occur in the same area, resulting in loss of fishing area to one or the other or in gear conflicts when both operations attempt to use the same space.

CONCLUSION: The proposed action, prior OCS sales, and other factors added to the widely varying baseline conditions resulting from natural environmental factors, may result in a high level of cumulative impact on the commercial fishing industry.

(e) Impacts on recreation and tourism

Refer to Section IV.B.4.a.(5)(e) for a discussion of the impact factors and direct and indirect effects of the proposed action on recreation and tourism.

Impact analysis

Continued OCS leasing over the next 5 years will result in an additional installation of an estimated 133 new platforms through the year 2005. Most of these structures will be far from shore and out-of-site from shoreline recreational and resort areas. The majority of the new production platforms constructed will also be too far from shore to have much of an effect on recreational fishing and scuba diving. Those that are accessible will likely replace those being removed. Removals in the major offshore fishing zones will begin to outspace installations during this 5-year period.

If new pipeline landfalls result from additional tracts leased over the 5-year period, they are expected to temporarily and locally impact use of recreation and tourist lands along the Mississippi and Alabama shorefront. As pipelines are planned developments associated with OCS product transmission needs, it is highly unlikely projected landfalls would reduce the level or quality of recreation or tourist activity anywhere. Should oil spills reach the shoreline in the eastern half of the planning area, localized and short-term impacts on recreation and tourism activity are likely to occur and will be more serious if the incident(s) are during the summer months. Trash and debris from offshore operations will continue to affect beach aesthetics and maintenance programs throughout the shorefront recreational and resort areas.

CONCLUSION: Continued OCS leasing for the next 5 years under the proposed alternative is expected to result in a low impact on recreation and tourism.

CUMULATIVE IMPACTS: Cumulative impacts will result from the combined action of former and future leasing on the OCS, State oil and gas leasing, and other activity contributing to the gravity of the impacting factors likely to affect recreation and tourism in the Gulf of Mexico. The number of offshore oil and gas structures is expected to peak at 3,500 and begin a gradual decline as removals begin to outpace new installations in the next 20 years. Development of permitted artificial reefs with obsolete production platforms is likely to replace artificial habitat losses and removal of fishing destination areas in this same time period. Offshore viewsheds will be further impacted by nearshore drilling rigs and platform installations, especially along the Mississippi and Alabama coasts. Although visible from shorefront park and resort areas when operating within 3-12 miles of shore, experience has demonstrated no adverse change in coastal recreational activities or tourist levels attributed to this impact.

The level of crude oil developed and imported is unlikely to decline, and one or more major oil spills can be expected to come ashore on one or more major shorefront recreational beaches. Partial closure of affected recreation areas can be expected to accommodate cleanup and containment. Recreation and tourism impacts will be localized with little or no regional implications. Indirect impacts are unlikely to change from current levels which have had no detectable adverse effect on the level of recreation and tourism activity. The level of trash and debris originating from the Gulf is expected to increase with time and increased commercial, industrial, and recreational activity in the Gulf of Mexico. Shorefront park, beach, and recreation areas will be continuously affected with an increasing trash load. Cost of beach maintenance and administrative programs will increase, beach aesthetics will decline, but the level of recreation and tourism activity is unlikely to change.

CONCLUSION: Planned development and accidents associated with continued development and use of the Gulf of Mexico, including the additional leasing projected under the proposed alternative, is expected to have a low impact on recreation and tourism.

(f) Impacts on archaeological resources

The impact factors and effects for archaeological resources are discussed in Section IV.B.4.a.(5)(f).

(i) Historic

Impact analysis: Since information contained in historical sites is often unrecorded in written historical accounts, physical alteration or destruction of complete sites or site components may result in the loss of information on our Nation's maritime and cultural heritage. Contamination of coastal historic sites by an oil spill would cause a temporary and reversible impact on the aesthetics of the site, but no loss of historical information.

The percent acreage leased that will be disturbed by projected development in archaeological Zone 1 (where the potential for shipwreck occurrence is assessed as being high) is 8.3%. Therefore, although there is the potential for a loss of significant historic archaeological data should a direct interaction occur between an impact producing factor and an historic shipwreck, the impact would be low to moderate.

There would be a maximum of 4,820 acres disturbed by onshore development. Due to the relatively low amount of acreage projected for disturbance, the visibility of most onshore historic sites and State and Federal cultural resource laws which require consideration of historic properties if any State or Federal funding or permits are required for construction, the expected impact to coastal historic sites as a result of the projected onshore development associated with the proposed action is very low.

One large spill (1,000 bbls or greater) and several smaller oil spills are assumed for this analysis. Should one or more of these spills contact a coastal historic site such as a fort or lighthouse, the major impact would be visual due to oil contamination of the site and its environment. This impact would probably be temporary and reversible with no actual loss of information.

CONCLUSION: The expected level of impact to historic archaeological resources is low.

CUMULATIVE IMPACTS: Other major factors which would affect significant historic archaeological resources in the Central Gulf include trawling, sport diving/commercial treasure hunting, hurricanes, channel dredging, previous oil and gas development, and chronic, low-level hydrocarbon contamination.

Of these factors, commercial treasure hunting, hurricanes, channel dredging, and cumulative levels of oil and gas development are assessed as having a high potential for causing loss of significant historic archaeological data (see Section IV.D.2.a.(11) of Final EIS 104/105).

The most intensive areas of trawling in the Central Gulf are represented by the centers of abundance for white shrimp. Extensive trawling within these areas would probably only affect the upper 3 inches or so of sediment (NERBC, 1980). Any shipwreck site components within 3 inches of the present seabed probably would be affected should the area be trawled. On many wrecks, this zone would already be disturbed by natural factors and would contain only artifacts of low specific gravity which have lost all original context and have been heavily abraded (Muckelroy, 1978). Therefore, the effect of trawling on most historic shipwreck sites would probably be very low.

Sport diving and commercial treasure hunting are a significant factor in the loss of historic data from wreck sites. While commercial treasure hunters generally impact wrecks with intrinsic monetary value, sport divers may collect souvenirs from all types of wrecks. The impact from these activities cannot be quantified.

About half of the coast along the Central Gulf was hit with 16-20 tropical cyclones between the years 1901-1955 (DeWald, 1980). The other half, between Atchafalaya Bay, Louisiana, and Texas, had a slightly lower incidence of cyclones (11-15). Seven major hurricanes also crossed the Central Gulf between the years 1954-1977. Shipwrecks in shallow waters are exposed to a greatly intensified longshore current during tropical storms (Clausen and Arnold, 1975). Under such conditions, it is highly likely that artifacts of low specific gravities (e.g., ceramics and glass) would be dispersed, leaving only the denser materials (iron, steel, ballast, and conglomerates) at the original site. Some of the original information contained in the site would be lost in this process, but a significant amount of information would also remain. Overall, a significant loss of data from historic sites has probably occurred, and will continue to occur, in the Central Gulf from the effects of tropical storms. Assuming that some of the data lost has been unique, this impact would be very high.

Because most channel dredging occurs at entrances to bays, harbors and ports, there is a high probability for impacts to historic sites because of high site densities in these areas. Assuming that some of the data lost have been unique, the impact to historic sites as a result of past channel dredging activities, would be very high.

Although no estimate as to the potential loss can be made, due to the magnitude of previous oil and gas activity, it is assumed that the impact from the loss of unique archaeological data in the Central Gulf has been very high.

It has been estimated that the annual input of petroleum into the Gulf from all sources approaches 2.3 million bbls. This chronic hydrocarbon contamination could have an impact on historic resources. However, since the impacts to historic sites from oil contamination are generally short-term and reversible, the expected cumulative impacts from oil contamination are estimated to be low.

CONCLUSION: The cumulative impact to the historic archaeological resources base in the Central Gulf will be very high.

(ii) Prehistoric

Impact analysis: Any *in situ* prehistoric site located on the Gulf of Mexico OCS would be completely unique at this point in time. As sites are discovered, those along relict shorelines, seaward of about the 20 m isobath, will provide unique archaeological data on coastal adaptations prior to the Late Archaic period. Such information is unavailable from terrestrial sites in North America because coastal areas for all cultural periods prior to the Late Archaic are currently submerged on our continental shelves. Archaeological data on prehistoric migrations, settlement patterns, and cultural contacts across now submerged land masses is also information which can only be obtained from submerged sites on the OCS.

Physical alteration or destruction of complete sites or site components may result in the loss of archaeological data on prehistoric migrations, settlement patterns, subsistence strategies, and cultural contacts for North America, Central America, South America, and the Caribbean.

The percent acreage leased that will be disturbed by projected development in archaeological Zones 1 and 2 (where the potential for prehistoric site occurrence is assessed as being high) is 8.3%. Therefore, although there is the potential for a loss of significant prehistoric archaeological data should a direct interaction occur between an impact producing factor and an inundated prehistoric site, the impact would be low to moderate.

There would be a maximum of 4,820 acres disturbed by onshore development. Due to the relatively low amount of acreage projected for disturbance and State and Federal cultural resource laws which require consideration of cultural resources if any State or Federal funding or permits are required for construction, the expected impact to coastal prehistoric sites as a result of the projected onshore development associated with the proposed action is very low.

One large spill (1,000 bbls or greater) and several smaller oil spill contacts are assumed for this analysis. Should one or more of these spill contacts be with a coastal prehistoric site, the potential for dating the site using Carbon-14 would be destroyed. However, if diagnostic artifacts are present in the site, loss of C-14 dating potential may not constitute a loss of unique information.

CONCLUSION: The impacts expected to prehistoric archaeological resources will be low.

CUMULATIVE IMPACTS: Other major factors which would affect significant prehistoric archaeological resources in the Central Gulf include trawling, hurricanes, channel dredging, previous oil and gas development, and chronic, low-level hydrocarbon contamination.

Of these factors, hurricanes, channel dredging, cumulative levels of oil and gas development, and chronic, low-level hydrocarbon contamination are assessed as having a high potential for causing loss of significant prehistoric archaeological data (see Section IV.D.2.a.(11) of Final EIS 104/105).
About half of the coast along the Central Gulf was hit with 16-20 tropical cyclones between the year 1901-1955 (DeWald, 1980). The other half, between Atchafalaya Bay, Louisiana, and Texas, had a slightly lower incidence of cyclones (11-15). Seven major hurricanes also crossed the Central Gulf between the years 1954-1977. These storms would affect coastal prehistoric sites on barrier islands and beach fronts by erosion and reworking of sediments which would either destory or change the context of site components. When the number of tropical storms recorded within this century is multiplied by 30 (for sites approximately 3,000 years old), it seems highly likely that many exposed coastal prehistoric sites have been, and will continue to be, destroyed by such storms. Assuming that some of the data lost has been unique, this impact would be very high.

Because most channel dredging occurs at entrances to bays, harbors and ports, there is a high probability for impacts to prehistoric sites because of high site densities in these areas. Assuming that some of the data lost have been unique, the impact to prehistoric sites, as a result of past channel dredging activities, would be very high.

Although information on the chronological distribution of past OCS development is not available for this analysis, development reached its peak after the archaeological resources survey requirement began. Assuming that the archaeological resource surveys, which have been required prior to lease development over the past eleven years, have been 90% effective in identifying areas having a high probability for the occurrence of prehistoric sites, the major impacts would have resulted from development prior to 1974. Although no estimate as to the potential loss can be made due to the magnitude of previous oil and gas activity, it is assumed that the impact from the loss of unique archaeological data in the Central Gulf has been very high.

It has been estimated that the annual input of petroleum into the Gulf from all sources approaches 2.3 million bbls. This chronic hydrocarbon contamination is much more significant in its potential impact on historic resources. The most serious effect of oil contamination is the alteration of the carbon content of organic materials in coastal prehistoric sites. This contamination may result in erroneous C-14 dates and the possible loss of all dating potential for a site. Thus, the loss of significant prehistoric site data may be very high.

CONCLUSION: The cumulative impact to the prehistoric archaeological resources base in the Central Gulf from impact producing factors is assessed as being very high.

(g) Impacts on marine transportation and ports

A description of impact factors and direct and indirect effects associated with marine transportation and ports may be found in Section IV.B.4.a.(5)(g).

Impact analysis

The Central Gulf contains the most established offshore infrastructure and onshore service base network in the region. No new port facilities are expected to be required as a result of the proposed action.

OCS-related vessel traffic is expected to increase by 12%, or 33,000 trips, in the peak year of activity over the current annual level of nearly 270,000 trips associated with oil and gas and all other activities. Approximately 133 structures are expected to be emplaced as a result of the proposed action. It is unlikely that these structures will be a significant hazard to navigation if regulations requiring adequate marking are adhered to. There are over 2,800 structures on the Central Gulf, so most who are involved in operations in the area are familiar with the potential problems. If foreign vessels and others who may not be acclimated to navigating these waters stay within the unobstructed safety fairways, problems should be minimal.

CONCLUSION: Increased vessel traffic expected in the peak of activity and new structures resulting from the proposed action indicate that impacts on marine transportation and ports will be low.

CUMULATIVE IMPACTS: Cumulative impact producing factors considered in this analysis include those related to the proposed action, prior OCS sales, and non-OCS marine traffic.

The impact analysis for the proposed action is based on expected increases in OCS-related vessel traffic over existing traffic levels. These existing levels include all known potential impact producing factors, with the exception of the expected impacts associated with future exploration, development, and production associated with prior sales.

Future OCS activities associated with prior sales and the proposed action are expected to increase vessel traffic levels by 57%, or 153,000 trips, in the peak year of activity over the current annual level of nearly 270,000 trips.

The development of infrastructure related to prior OCS sales and the proposed action is expected to result in up to 3,584 platforms.

The addition of new structures to those already in place could have a significant impact on navigation in the area, but for the fact that the emplacement of the structures would be paced over a period of about 24 years. This should provide ample time for mariners to adapt to the increase in the number of platforms.

CONCLUSION: Increased vessel traffic, structures, and all other potential impact producing factors indicate that during the peak year of combined activity the cumulative impacts on ports and marine transportation will be high.

(h) Impacts on military uses

Refer to Section IV.B.4.a.(5)(h) for a discussion of impact factors and the direct and indirect effects of the proposed action on military uses in the Gulf.

Impact analysis

Ten percent, or 4,078,000 acres, of the water and air space of the Central Gulf is used for the various military operations within three warning areas. Refer to Figure III.B.1.c-1.

W-453 is an Air National Guard training area, and W-92 is a Naval Air Reserve training area. In both areas, use may be infrequent and heavier on particular days of the week (weekends) or a particular time of the year (summer).

An intensive use of W-92 or W-453 has not been indicated by the Navy or Air Force in the past. W-92 and W-453 have had very little oil and gas development; consequently, past impacts of oil and gas development have been very low. Recent oil and gas activities have forced an adjustment of the boundaries of warning area 155, south of Pensacola. Further such moves are not expected and impacts should be low.

CONCLUSION: The estimated level of impact resulting from the proposed action on military use of the warning areas is expected to be low.

CUMULATIVE IMPACTS: Cumulative impacts will relate to oil and gas development associated with past lease sales and present trans-Gulf vessel traffic and commercial and recreational fishing to and from Central Gulf ports.

The impacts from past oil and gas lease offerings have been very low. In W-453, there are currently active leases within which five wells have been drilled or permitted (four wells were dry). In W-92, 52 blocks have been leased and limited drilling has taken place. Impacts, thus far, have been nonexistent in W-92 and very low in W-453.

The cumulative numbers of service vessel trips and helicopter flights have not increased sufficiently to present an interference with military operations nor will the number of exploration rigs and platforms restrict, curtail, or shift military missions within W-453 and W-92. However, the cumulative number of projected exploration rigs and platforms recently caused an adjustment of the W-155 boundary.

In addition to the impacts from oil and gas activities, ocean-going vessel traffic and commercial and recreational fishermen and boaters impact the military operations in the Central Gulf of Mexico.

In 1981, 268,340 vessels of all drafts entered and exited ports in southeast Louisiana, Mississippi, and Alabama. Of this total, approximately 20,000 vessels of draft greater than 18' traversed the deeper Gulf waters. Only in those areas adjacent to Alabama and Mississippi would the vessel traffic close to shore affect military operations in W-453 and W-155. Warning Area 92 is affected by only the deepwater traffic traversing the Gulf. At present, the military has no operational control over vessel traffic into the warning areas, and in many cases no warning of when and where this traffic is crossing the warning areas.

Commercial fishing vessels are covered in the above statistics of all vessel traffic; however, recreational fishing boats are not. Warning Area 92 is at too great a distance from shore to be affected by recreational fishing boats; however, W-453 and W-155 being closer to shore have large numbers of recreational fishermen, sailboaters, and other recreational boaters passing into and through the warning areas. Due to the lack of oil and gas development off Mississippi and Alabama, the impact of other vessels and boats by sheer numbers is far greater than the impact projected from oil- and gas-related vessel traffic.

All air traffic is controlled by the FAA, and civilian air traffic into the warning areas is either curtailed, prohibited, or, in most cases, rerouted to avoid conflicts with military operations during their peak or intensive use periods.

CONCLUSION: The estimated levels of cumulative impacts on the warning areas is expected to be low for W-453 and W-92 and moderate for W-155.

b. Unavoidable Adverse Impacts

Refer to Section IV.B.4.j. for a discussion of unavoidable adverse impacts resulting from the proposed action throughout the Gulf of Mexico.

c. Relationship Between the Short-term Use of Man's Environment and the Maintenance and Enhancement of Long-term Productivity

Refer to Section IV.B.4.k. for a Gulf of Mexico-wide discussion of this topic.

d. Irreversible and Irretrievable Commitment of Resources

Refer to Section IV.B.4.1. for a Gulf of Mexico-wide discussion of this topic.

e. Impacts of High Case Scenario

(1) Physical Environment

(a) Impacts on water quality

The estimated discharge of up to 1.9 billion bbls of formation waters, 26.9 million bbls of drilling muds, 3.03 million cu. yds. of drill cuttings, 1.05 million bbls of sand from drilling operations, and an average of 5,500 gallons/day/platform of treated sanitary and domestic wastes may be expected as a result of this scenario. Pipeline-related activities would result in the disturbance of up to 17.9 million cu. yds. of sediment.

Offshore waters will be subject to impacts from discharges of drilling fluids, formation waters, and other effluents which add burdens of both toxic and nontoxic materials to the water column. However, the natural processes of dispersion, degradation, and sedimentation will result in immeasurably low concentrations of these materials within a few meters to a few kilometers of the discharge site, resulting in low impacts.

Discharge from onshore support facilities is estimated to be minimal with impacts to onshore water quality expected to be very low. These impacts may stem from the construction and operation of OCS onshore facilities, particularly the estimated 6 gas processing plants, 225-1,125 miles of onshore pipelines, and 10 new service bases.

CONCLUSION: The overall impact to water quality is estimated to be low; whereas, the impact to onshore water quality is estimated to be moderate.

(b) Impacts on air quality

Refer to the analysis for the Western Gulf of Mexico in Section IV.B.4.h.(3)(b) on air quality.

CONCLUSION: Low impacts are expected in St. Bernard, Plaquemines, St. Mary, LaFourche, St. Charles, Jefferson, Orleans, and St. John the Baptist Parishes in Louisiana and Mobile County in Alabama. Very low impacts are expected throughout the remainder of the coastal area.

(2) Biological Environment

(a) Impacts on plankton

The increased activity associated with the high case scenario will subject the Gulf waters to discharges of drilling fluids, formation waters, and other effluents which add burdens of toxic and nontoxic materials to the water column.

Refer to Section IV.B.5.a.(3)(a) for a discussion of these added burdens. However, the natural processes of dispersion and dilution will result in immeasurably low concentrations of these materials within a few meters to a few kilometers of the discharge site. Only those plankton in the immediate vicinity of the discharge site would be affected.

CONCLUSION: The expected level of impact on plankton is very low.

(b) Impacts on benthos

The benthos of topographic high and live bottom areas are expected to receive a very high level of impact from the proposed action. Any increase in activity within these areas resulting from the high case scenario would have a very high level of impact on these communities.

CONCLUSION: The expected level of impact is low; however, for benthic communities associated with topographic highs and live bottom areas, the impact would be very high.

(c) Impacts on fish resources

Six large spills (1,000 bbls or greater) are assumed under the high case scenario for this area. A total of 1,830 miles of new pipelines are also expected to result under this scenario. A large spill contacting open bays containing finfish and shellfish nurseries and/or spawning grounds could cause severe, medium-term effects on fish resources. Pipeline placement activities would have localized impacts on fish resources, including the destruction of benthic species, fishery habitats, and increased turbidity. Refer to Section IV.B.5.a.(4)(c) for an additional discussion of impacts on fish resources.

CONCLUSION: The level of expected impact on fish resources is estimated to be moderate.

(d) Impacts on marine mammals

Up to six oil spills of 1,000 bbls or greater and several smaller spills are assumed for this analysis. As indicated previously, only a small portion of the marine mammals would be exposed to potential OCS-related oil spills. The level of impact to marine mammals from these oil spills would be low.

Vessel traffic is estimated to increase about 3% under the high case scenario, slightly increasing the potential for collisions with marine mammals. It is estimated that the level of impact to marine mammals from this increased vessel traffic would be very low.

About 5,927 wells will be drilled, and additional seismic activities will be required over the assumed 20 to 30 year period of the proposed action. The effect of this increased activity and noise disturbance to marine mammals is unknown. However, as this disturbance is usually short-term and fairly localized, the level of impact on marine mammals is estimated to be low.

CONCLUSION: The level of impact to marine mammals as a result of the high case scenario is estimated to be low.

(e) Impacts on coastal and marine birds

Up to six oil spills of 1,000 bbls or greater and several smaller spills are assumed for this analysis. It is estimated that the level of impact to coastal and marine birds from these oil spills would be moderate.

OCS-related air and vessel traffic is estimated to increase about 3%, up to 15 oil/gas pipeline landfalls, 8 supply bases, and up to 14 other onshore facilities are estimated under the high case scenario. This potential OCS-related activity is estimated to result in a moderate level of impact on birds.

CONCLUSION: The level of impact to coastal and marine birds as a result of the high case scenario is estimated to be moderate.

(f) Impacts on endangered and threatened species

As indicated previously only a small portion of the endangered and threatened species habitat would be contacted by the estimated six oil spills and several smaller spills estimated for the high case scenario. It is estimated that the level of impact to endangered and threatened species from oil spills would be moderate.

Air and vessel traffic is estimated to increase about 3% under the high case scenario, slightly increasing the potential for collisions with endangered and threatened species. It is estimated that the level of impact to endangered and threatened species from this increased air and vessel traffic would be very low.

About 15 oil/gas pipeline landfalls, 8 supply bases, 14 other onshore facilities, 1 navigation channel, and an undetermined amount of maintenance dredging of existing canals are estimated under the high case scenario. It is estimated that this activity could result in a moderate level of impact to endangered and threatened species.

CONCLUSION: The level of impact to endangered and threatened species as a result of the high case scenario is estimated to be moderate.

(g) Impacts on seagrasses

Up to six oil spills of 1,000 bbls or greater and several smaller spills are assumed for this analysis. As indicated previously, a moderate portion of the seagrasses could be exposed to potential OCS-related oil spills. It is estimated that the level of impact to seagrasses from these oil spills would be low.

Up to 15 oil/gas pipeline landfalls, 1 navigation channel, and an undetermined amount of maintenance dredging of existing canals are estimated. It is estimated that up to 204 acres of seagrasses could be damaged or destroyed as a result of these activities. This represents a loss of up to 0.4% of the total seagrasses and an estimated moderate level of impact.

CONCLUSION: The level of impact to seagrasses as a result of the high case scenario is estimated to be moderate.

(h) Impacts on wetlands

Up to six oil spills of 1,000 bbls or greater and several smaller spills are assumed to occur as a result of the high case scenario. About three-fourths of the coastal wetlands could be exposed to potential oil spills, and a portion of these wetlands could be damaged or destroyed. It is estimated that the level of impact to wetlands from oil spills could be moderate.

Up to 15 oil/gas pipelines, up to 8 supply bases, up to 14 new onshore facilities, 1 navigation channel, and an undetermined amount of maintenance dredging of existing drainage canals and navigation channels are estimated. It is estimated that up to 3,000 acres of wetlands could be damaged or destroyed if these facilities are located in wetland areas. This represents a loss of up to 0.1% of the total wetlands and could result in an estimated low level of impact.

CONCLUSION: The level of impact to wetlands as a result of the high case scenario is estimated to be moderate.

(i) Impacts on areas of special concern

It can be expected that at least some of the 277 platforms and 2,600 exploration and delineation wells may be sited and on near the topographic highs or the live bottoms. Direct contact between oil and gas operations in the form of platform construction and drill rig and service boat construction could have direct physical impact by breaking, damaging and overturing coral formations or sessile life forms. Direct damage may also occur through the smothering action of discharged drill muds and cuttings, while the release of effluents such as farmation waters, drill muds, and chronic hydrocarbon discharges could degrade water quality to such an extent that living organisms could be adversely affected. Should one of the six oil spills of 1,000 barrels or greater occur in such manner that oil, or an oil/water emulsian should come in contact with a live bottom or topographic high (as from an underwater blowout) organisms within the areas of special concern could be adversely affected with recovery times lasting many years especially for some coral communities.

CONCLUSION: The expected level of impact is very high.

(j) Impacts on marine sanctuaries

There are no marine sanctuaries in the Central Gulf of Mexico.

(3) Socioeconomic Environment

(a) Impacts on local employment and demographic conditions

This scenario is expected to generate a greater level of employment in the Central Gulf coastal region than the development scenario associated with the proposed action. Unlike the analysis associated with the proposed action, there will be new resident activity associated with the maximum case. New resident employment, payroll, and population is expected to peak in the year 2000 over a 9-year period at about 9,000 jobs, $159 million, and 21,000 people, respectively. A breakdown of these new resident projections by coastal subarea indicates the impact in the Central coastal areas to be very low, i.e., less than 1% of the total employment, payroll, and population in the region. However, the impact in the Lake Charles area is expected to be low since peak new resident activity will represent about 2% of the total employment, payroll, and population in that subarea.

CONCLUSION: The expected levels of impact are very low for most of the coastline, low for the Lake Charles area.

(b) Impacts on coastal land uses

An increase in oil and gas activity under the high case would result in the addition of up to 10 new service bases, 4 new platform fabrication yards, and 6 new gas processing plants. These new facilities may require the conversion of existing developed land or the improvement of raw land. State and local land use policies indicate that potential incompatibilities or conflicts may be avoided or effectively mitigated through a sufficiently flexible regulatory framework, capable of reconciliation of most site-specific problems which may emerge after the sale.

CONCLUSION: The analysis indicates that it is possible for the activities/facilities resulting from the proposed action to be designed, located, constructed, and operated in a manner such that the expected level of impact on State and local land use management policies will be low.

(c) Impacts on water supply

The addition of up to 10 new service bases, 4 new platform fabrication yards, and 6 new gas processing plants will impact area water supplies. As a result of this, the impacts to the regional water supply are expected to be high, with several areas being substantially affected and requiring modification of existing facilities.

CONCLUSION: The impact on area water supply is estimated to be high.

(d) Impacts on commercial fisheries

An estimated 277 platforms are expected under the high case scenario, eliminating less than 0.1% (831-1,385 acres) of the trawling area. Six large spills (1,000 bbls or greater) are assumed for this area under tne high case. A large spill contacting with open bays containing finfish and shellfish nurseries and/or spawning rounds could cause severe, medium-term effects on fisheries. Refer to Section IV.B.4.a.(5)(d) for an additional discussion of impacts on commercial fisheries.

CONCLUSION: The level of expected impact on the commercial fishing industry is estimated to be moderate.

(e) Impacts on recreation and tourism

Continued OCS leasing will result in the additional installation of an estimated 277 new offshore platforms through the year 2009. These platforms and the prerequisite exploratory drilling rigs will be at least 3 miles from shore and coastal shorefront recreational and tourist centers. Those platforms and drilling rigs operating within 3-15 miles of shore will be visible from shore during clear weather conditions and will impose a limited amount of distraction from the background viewshed of coastal recreation shorefronts. Those production platforms installed within 25 miles of major population centers and resort communities are likely to become popular fishing locations.

Assuming the high case scenario results in multiple oil and gas field discoveries throughout the planning area, additional pipeline landfalls can be expected to accommodate product transmission to processing and refinement centers. Additionally, the potential for oil spills occurring and contacting shorefront recreational resources is likely to increase. The amount of trash and debris washing ashore from offshore operations will also increase.

CONCLUSION: The overall effect on recreation and tourism is expected to be moderate.

(f) Impacts on archaeological resources

(Historic) Under the high case scenario, the percent of acreage leased that will be disturbed by projected development in archaeological Zone 1 (where the potential for shipwreck occurrence is assessed as being high) is 8.1%. Therefore, although there is the potential for a loss of significant historic archaeological data should a direct interaction occur between an impact producing factor and an historic shipwreck, the potential for such an interaction occurring is assessed as being low to moderate.

There would be a maximum of 16,460 acres disturbed by onshore development. Due to the visibility of most onshore historic sites and State and Federal cultural resource laws which require consideration of historic properties if any State or Federal funding or permits are required for construction, the expected impact to coastal historic sites in the CPA as a result of the projected onshore development associated with this scenario is very low.

Up to four oil spills of 1,000 bbls or greater and several smaller oil spill contacts are assumed for this analysis. Should one or more of these spill contacts be with a coastal historic site such as forts and lighthouse, the major impact would be visual due to oil contamination of the site and its environment. This impact would probably be temporary and reversible with no actual loss of information.

Conclusion: The impact to archaeological resources will be low.

(g) Impacts on archaeological resources

(Prehistoric) Under the high case scenario, acreage leased that will be disturbed by projected development in archaeological Zones 1 and 2 (where the potential for prehistoric site occurrence is assessed as being high) is 8.1%. Therefore, although there is the potential for a loss of significant prehistoric archaeological data should a direct interaction occur between an impact producing factor and an inundated prehistoric site, the potential for such an interaction occurring is assessed as being low to moderate.

Under this scenario, there would be a maximum of 16,460 acres disturbed by onshore development. Due to State and Federal cultural resource laws which require consideration of cultural resources if any State or Federal funding or permits are required for construction, the expected impact to coastal prehistoric sites as a result of the projected onshore development associated with the proposed action is very low.
Up to four oil spills of 1,000 bbls or greater and several smaller oil spill contacts are assumed for this analysis. Should one or more of these spill contacts be with a coastal prehistoric site, the potential for dating the site using Carbon-14 would be destroyed. However, if diagnostic artifacts are present in the site, loss of Carbon-14 dating potential may not constitute a loss of unique information.

CONCLUSION: The impact to prehistoric archaeological resources would be low.

The loss of C-14 dating potential of a site as the result of oil spill contamination probably would not destroy unique information; therefore, this impact also would be low.

(h) Impacts on marine transportation and ports

Vessel traffic is expected to increase by 26%, or 69,000 trips, in the peak year of activity over the current annual level of 270,000 trips associated with oil and gas and all other activities.

Approximately 277 structures are expected to be added to the 2,800 platforms currently in the area. It is unlikely that the additional structures will create a significant hazard to navigation if regulations pertaining to adequate markings are adhered to and if locations are made known to mariners.

CONCLUSION: Increased vessel traffic expected in the peak year of activity and structures resulting from the proposed action indicate that impacts on affected marine transportation and ports will be moderate.

(i) Impacts on military uses

The highest number of wells projected to be drilled in W-155 and W-453 would be 20, and only one platform would result. With very little activity at present in these warning areas, the locations and service vessel and helicopter travel of seven exploratory drilling rigs and one platform over a period of 10 years would have a moderate impact.

Within W-92, the highest number of wells anticipated as a result of this scenario would be 38, and two platforms. With no activity in W-92 at present and a low intensity and frequency use by DOD, the impact level would be low.

CONCLUSION: The level of impacts will be moderate in W-453 and W-155, low in W-92, and Eglin Water Test Areas 1 and 3.

f. Alternative II - Subarea Deferral

This alternative evaluates the deferral from leasing, in the 5-year program, of 13 subareas in addition to those deferred under the proposed action. None of these additional subareas are located with the Central Gulf; therefore, it is anticipated that the adoption of this alternative will have no affect on the resource and infrastructure estimates projected under the proposed alternative. The expected levels of impact, on the various topics of concern, will, therefore, be the same as for the proposed action.

g. Alternative III - Add a Sale in the Straits of Florida

This alternative would add a lease sale (1991) in that portion of the Florida Straits planning area south of the Florida Keys, to the 5-year leasing schedule as prescribed under the proposed action. It is anticipated that the addition of this sale, will have no affect on the resource and infrastructure estimates projected for the Central Gulf under the proposed action. The expected levels of impact, on the various topics of concern, will, therefore, be the same as for the proposed action.

h. Alternative IV - Biennial Leasing

This alternative proposes a biennial pace of leasing in those Federal OCS leasing areas which have triennial sales under the proposed action. The alternative retains the annual leasing pace in the Central and Western Gulf; therefore, it is anticipated that this alternative will have no effect on the resource and infrastructure estimates projected for the Central Gulf under the proposed action. The expected levels of impact in the Central Gulf, on the various topics of concern, will, therefore, be the same as for the proposed action.

i. Alternative V - The Acceleration Provision

This alternative evaluates the effects of the implementation of the acceleration provision in all areas outside of the Western and Central Gulf of Mexico which have a triennial pace of leasing under the proposed action. The alternative provides the flexibility needed to adjust the 5-year program's schedule in the event of major unforeseen developments by permitting this acceleration from triennial to biennial sales. The alternative retains the annual leasing pace in the Central and Western Gulf; therefore, it is anticipated that this alternative will have no affect on the resource and infrastructure estimates projected for the Central Gulf under the proposed action. The expected levels of impact in the Central Gulf, on the various topics of concern, will, therefore, be the same as for the proposed action.

j. Alternative VI - Defer Leasing in Six Planning Areas

This alternative evaluates the deferral from leasing during the proposed 5-year program, six Federal OCS planning areas. The Central Gulf is not included as one of these areas to be deferred; therefore, it is anticipated that the adoption of this alternative will have no affect on the resource and infrastructure estimates projected under the proposed action. The expected levels of impact, on the various topics of concern, will, therefore, be the same as for the proposed action.

k. Alternative VII - No Action

Impact Analysis

The sales which would be held in this area as a result of the adoption of this 5-year schedule would not be held. Currently ongoing activity would not lease, nor would new activity on already leased blocks be stopped. The economic impacts of cancellation of these sales could be far-reaching. Increased exploration activity on recently acquired leases could partially offset a one-year delay, resulting in negligible socioeconomic impacts. A lengthy delay, however, could seriously affect the economic stability of the coastal region. The infrastructure for oil and gas production in the Gulf of Mexico is highly concentrated in the coastal areas of Louisiana and Texas. The OCS oil and gas program is a major source of employment and revenue in the area. Approximately 130,000 jobs are directly or indirectly dependent on the offshore program. The average annual payroll associated with oil and gas acitivities amounts to approximately $2.9 billion for the Gulf Coast region. The State and local taxes generated annually by the

Federal program are approximately $232.6 million. Cancellation of these sales could reduce the amount of exploration activity, the number of exploratory wells drilled, the number of workers and facilities employed by the industry, and the payroll and tax revenues generated.

All positive and negative impacts associated with the proposed action (as discussed in Section IV.B.5.a.) would be cancelled.

The opportunity would be foregone or postponed for development of the 1 billion bbls of oil and 8.3 tcf of gas in the Central Gulf. Development of alternative energy supplies as replacement resources for lost domestic production is discussed in Section VIII.C.

Activities expected to result from this proposal, the drilling of over 2,700 wells of all types, resulting in the discharge of over 600,000 barrels of drill muds and over 360,000 barrels of cuttings, and the construction of up to 133 platforms would not take place as scheduled. Immediate effects in the planning area would not be noticeable as currently ongoing activity would continue. The environmental effects would become noticeable in five or more years as major expanding oil and gas fields could not be developed as rapidly because of the lack of newly acquired tracts. The drilling of exploratory and deliveration wells and the construction of platforms in those areas, on new tracts, would not take place. Therefore environmental impacts expected on tracts that would have been rented as a result of this proposal would not take place in the immediate future. It is unlikely that activity would cease however, as much exploration and production remains to be carried out on currently rented tracts. The impacts on the various resources would therefore continue to occur at the present rate. The principle difference would be that localized impacts would not occur on tracts that would have been leased due to the adoption of this schedule, but overall impacts in the planning area would occur at about the levels expected from the proposal.

CONCLUSION: Environmental impacts on tracts that would have been leased as a result of this proposal would be avoided or delayed, but overall environmental impacts to the planning area firm existing sources would continue at the present rate.

See Section II.A.7 for a summary of impacts of alternative energy sowells. Adverse socioeconomic impacts could include a loss of employment opportunities, payroll revenues, and tax revenues.

6. Eastern Gulf

a. Alternative I - Proposed Action

(1) Interrelationship of Proposal with Other Projects and Proposals

(a) National Parks and Sanctuaries

The Florida units of Gulf Islands National Seashore are composed of the Naval Live Oaks, Fort Pickens, and Santa Rosa Island and extend along the western end of the area (see Section IV.B.5.a.(1)(a) for further discussion of Gulf Islands National Seashore). Fort DeSoto National Memorial is a small historic park near Bradenton, Florida; however, Big Cypress National Preserve, Everglades National Park, Fort Jefferson National Monument, and Biscayne National Park encompass a large portion of southern Florida's marine, estuarine, and freshwater environments. The health and well being of the subtropical environments protected in these parks are closely tied to the natural water cycles associated with the expansive wetlands in southern Florida. With proper concern and understanding of the ecological and oceanographic complexities of the south Florida ecosystems, OCS oil and gas leasing and development should pose no permanent threat to the integrity or appreciation of these unique marine and freshwater environments.

There are no marine sanctuaries on the Eastern Gulf of Mexico OCS. The Big Bend Seagrass Beds are on the NOAA Site Evaluation List. Should a sanctuary be established, restrictions could occur on oil and gas activities.

(b) Coastal Zone Management

Refer to Section IV.B.4.a.(1)(b) for a discussion of coastal zone management within the Gulf of Mexico.

(c) Military Uses

Refer to Section IV.B.4.a.(1)(c) for a discussion of military uses within the Gulf of Mexico. See Figure III.B.3.c.-1.

(d) Ocean Dumping

There are no EPA designated ocean dumping sites in the Eastern Gulf of Mexico.

(2) Projects Considered in Cumulative Impact Assessment

(a) Oil and Gas Activities (Federal and State)

Refer to Section IV.B.5.a.(2)(a) for a discussion of oil and gas activities considered in the cumulative impact assessment.

(b) Military Operations

Refer to Section IV.B.4.a.(2)(b) for a discussion on military operations within the Gulf of Mexico.

(c) Marine Vessel Traffic

Refer to Section IV.B.4.a.(2)(c) for a discussion on marine vessel traffic in the Gulf of Mexico.

(3) Physical Environment

(a) Impacts on Water Quality

Refer to Section IV.B.4.a.(3)(a) for a discussion of impact factors and the direct and indirect effects of the proposed action on water quality.

Offshore

Impacts to offshore water quality will occur as a result of increased OCS activities in the Eastern Gulf. The addition of some 19 exploration/delineation wells, 36 development/production wells, 2 platforms, and up to 80 miles of pipelines are estimated for this area. Under this scenario, the discharge of an estimated 0.62-55.8 million bbls of formation waters, 0.25 million bbls of drilling muds, 0.028 million cu. yds. of drill cuttings, 31,000 bbls of sand from drilling operations, and an average of 5,500 gallons/platform/day of treated sanitary and domestic wastes from platforms may be expected as a result of this alternative. Pipeline-related activities would result in the disturbance of up to 0.48 million cu. yds. of sediment under the same scenario. Most offshore impacts would be localized around OCS facilities and will be of a temporary nature due to dilution and dispersion characteristics of the receiving body of water. One oil spill greater than or equal to 1,000 bbls is projected for the Eastern Gulf as a result of OCS production. Petroleum hydrocarbons introduced into the marine and coastal waters as a result of this spill may have varied effects on the local biota with impacts ranging from negligible to very high, depending on the resource affected, the stage of weathering, and the local physical and meteorological parameters. Normal weathering processes, encountered with oil spilled into open water conditions, tend to detoxify the spilled oil by breaking down the toxic components of the oil.

Immediate effects would be brought on by increased drilling, construction, and pipelaying activities, causing an increase in water column turbidities of the affected waters. Such increases would have a nominal impact on the productivity of phytoplankton, but may cause a temporary clog in the respiratory and feeding mechanisms of numerous benthic and pelagic marine organisms within the area of construction. Pipeline construction activities may also result in the resuspension of settled pollutants, toxic heavy metals, and pesticides if present.

The discharge of treated sanitary wastes from the various rigs and platforms will increase levels of suspended solids, nutrients, chlorine, and BOD in a small area near the point of discharge.

During the course of exploration drilling, production, and workover phases resulting from the proposed action, the discharge of drilling fluids, cuttings, produced water, and sand will degrade the quality of the waters surrounding the proposed new platforms.

Offshore water quality degradation will occur within the immediate vicinity of exploration and production sites with high impacts expected to occur within a few meters to tens of meters from the discharge source. These impacts, however, will decrease to very low with distance (500-1,000 m) from the source.

CONCLUSION The overall impact to offshore water quality is estimated to be low.

CUMULATIVE IMPACTS

Increased oil/gas exploration and development activities in the Eastern Gulf will contribute to the cumulative impacts on offshore water quality in this region. These activities, along with ocean dumping and increased vessel traffic, are among the contributors to areawide water quality degradation. For a discussion on other factors considered to cumulatively impact water quality, see Chapter IV.B. for the Western Gulf under offshore water quality, cumulative impacts.

Approximately four mobile rigs currently operate in the Eastern Gulf Federal OCS, there are no platforms. The construction of several additional pipelines from existing lease blocks in both Federal and State waters may occur in the future as a result of increased development activities in these areas.

The addition of some 131 exploration/delineation wells, 247 development/production wells, 13 platforms, and up to 430 miles of pipelines are estimated for this area as a result of the proposed action and prior OCS sales. This could result in the discharge of up to 0.37 billion bbls of formation waters, 1.7 million bbls of drilling muds, 0.19 million cu. yds. of drill cuttings, and an average of 5,500 million gallons/day/platform of treated sanitary and domestic wastes from platforms. Pipeline-related activities could result in the disturbance of some 26 million cu. yds. of sediment.

Offshore waters will, therefore, be subject to cumulative impacts from discharges of drilling fluids, formation waters, and other effluents which add burdens of both toxic and nontoxic materials to the water column. However, the natural processes of dispersion, degradation, and sedimentation will result in immeasurably low concentrations of these materials within a few meters to a few kilometers of the discharge site, resulting in low cumulative impacts.

CONCLUSION The overall cumulative impacts factors can be expected to be very high.

Onshore

Onshore water quality degradation will occur as a result of increased nonpoint and point sources of pollution, especially in those areas of Florida (Perdido, Escambia, Hillsborough, and Tampa Bays) where water quality problems persist. Impacts to onshore water quality will occur as a result of runoff from construction and operation of onshore facilities supporting expanded OCS activities in this region. The construction of onshore pipeline will create nonpoint source increases in surface runoff to nearby streams and rivers. Nonpoint source impacts may be minimized by controlling erosional effects generated within construction site boundaries, with several of the adverse impacts being localized and prevented from having offsite impacts to water bodies in the vicinity of these activities. Point source increases would also occur from effluent discharges related to OCS support activities, primarily the discharge of OCS produced waters piped ashore for treatment and discharge; however, any potential adverse impact can be mitigated by Federal and State water pollution control regulations and permitting.

As was shown, produced waters which are piped ashore are subject to treatment prior to discharge, according to Federal and State regulations and permitting requirements. However, it should be noted that this treatment is only used in the extraction of oil and grease contaminants. These waters may, therefore, contain high concentrations of TDS, oxygen demanding wastes, toxic heavy metals, aromatic hydrocarbons, and environmentally high levels of radionuclides. In open ocean situations the discharge of these components appears to contribute minor impacts to the surrounding discharge area; however, in shallow semi-enclosed estuarine environments, impacts could be extremely high depending on the physical and biological components of each system. Additional information on the location of discharge sites, daily discharge rates at each site, and the nature of the environment (background levels, etc.) in each area will be needed to determine the extent of impacts.

Although onshore water quality impacts are estimated to be low, effluents discharged in connection with OCS support facilities, suggested as having little or no impact, may be extremely damaging when released into sensitive habitats having a reduced capacity for pollution assimilation.

CONCLUSION The overall impact to offshore water quality is estimated to be low.

CUMULATIVE IMPACTS

Increased oil/gas exploration and development activities in the Eastern Gulf will contribute to the cumulative impacts on onshore water quality in this region. These activities, along with current and future activities associated with State tidelands' oil and gas operations, industrial and municipal waste discharges, ocean dumping, and increased vessel traffic, are among the contributors to areawide water quality degradation. For a discussion on other factors considered to cumulatively impact water quality, see Chapter IV.B. for the Western Gulf under onshore water quality, quality, cumulative impacts.

No platforms (multiwell) are currently operating in the Eastern Gulf State waters (1985). An unknown number of structures may be constructed as a result of resource development in State-owned coastal waters. The construction of several additional pipelines from existing lease blocks in both Federal and State waters may occur in the future as a result of increased development activities in these areas. Pipeline-related activities resulting from prior OCS sales could result in the disturbance of some 2.6 million cu. yds. of sediment. Onshore water quality degradation will occur as a result of increased nonpoint and point sources of pollution associated with construction and operation of this new onshore infrastructure.

Offshore and nearshore waters will, therefore, be subject to cumulative impacts from discharges of drilling fluids, formation waters, and other effluents which add burdens of both toxic and nontoxic materials to the water column. However, the natural processes of dispersion, degradation, and sedimentation will result in immeasurably low concentrations of these materials within a few meters to a few kilometers of the discharge site, resulting in low cumulative impacts.

CONCLUSION The overall cumulative impacts which include the effects of non-OCS-related factors can be expected to be very high, primarily in those highly urbanized and industrialized coastal areas currently experiencing water quality problems.

(b) Impacts on Air Quality

Refer to Section IV.B.4.a.(3)(b) for a discussion of the impact factors, and the direct and indirect effects of the proposed action on air quality.

The ambient air quality is generally better than the national standards with violations of the NAAQS occurring in some coastal areas; these areas where violations occur are designated as nonattainment areas. Additionally, there are three PSD Class I areas in the coastal region (Chassahowitzha, Everglades, and St. Marks Areas), whereby a small amount of degradation to ambient air quality is considered significant. All nonattainment areas and PSD Class I areas are identified in Section III.B.3.a.(8).

The proposed action is expected to result in a minimum number of new facilities offshore and one new gas processing plant onshore (Escambia County) that would be instrumental in the degradation of onshore air quality. It is expected that no new crude oil refineries will be needed to handle additional needs. Offshore, 19 exploration and delineation wells, and 36 development wells are expected to be drilled and 2 production platforms utilized.

One oil spill greater than 1,000 bbls is estimated to occur as a result of the proposed action. Significant degradation of onshore air quality is not expected to occur due to the low number of expected spills and natural dispersing mechanisms. Blowout emissions can be considered a point source and have the potential of dispersing over land, depending on the location of the event and local wind conditions. Emissions from these sources farther offshore have little potential of degrading onshore air quality.

Operational emissions from routine offshore activities (exploration, platform installation, development drilling, and the production phases) emit moderate amounts of criteria pollutants. Controls or offsets are not expected to be necessary for offshore facilities.

CONCLUSION The overall impact on coastal air quality from the proposal and all impact producing factors related to exploration, development, and production is expected to be low in Hillsborough, Pinellas, Hernando, Wakulla, Jefferson, Monroe, and Dade Counties; and verylow throughout the remainder of the coastal areas.

CUMULATIVE IMPACTS

Thirteen platforms, 247 production wells, and 131 exploratory wells are estimated to result from leasing through 1992. Considering such factors as distance to shore, climatological conditions, and emission producing equipment (internal combustion engines), each platform is analyze as to its contribution to air quality degradation. Thus far, the air quality analysis identifies a negligible contribution.

The are no existing platforms in the Eastern Gulf; however, there are activie leases in this area. The estimated number of wells and platforms from these is expected to be very low.

Point source emissions from onshore activities, such as power generation facilities, industrial processing or manufacturing facilities, waste incineration facilities, and mobile emissions sources (automobiles, waterborne transportation, etc.), are expected to increase at rates in proportion to the growth of population. Energy conservation, improved generation facilities, and new waste disposal technology are factors that is not expected to degrade beyond the point where the NAAQS's are exceeded due to existing regulatory control.

CONCLUSION The overall cumulative impacts will be moderate.

(4) Biological Environment

(a) Impacts on Plankton

Refer to Section IV.B.4.a.(4)(a) for a discussion of impact factors, and the direct and indirect effects of the proposed action on plankton.

The proposal is expected to result in the drilling of over 55 wells and the enplacement of 2 platforms throughout the area. This would result in the dumping of over 250,000 barrels of drill muds, around 7,000 barrels of cuttings, and as much as 55 million barrels of formation waters. This will take place over a period of 30 to 35 years. The extent of the waters into which this activity will take place will preclude all by localized and temporary impacts in the immediate vicinity of drill rigs and platofrms.

The activities associated with oil and gas leasing in the Eastern Gulf of Mexico would be temporary and localized. Any adverse effects on plankton resulting from the proposed action would be localized, with populations expected to recover quickly.

CONCLUSION The level of impact on plankton is expected to be very low.

CUMULATIVE IMPACTS

Gulf plankton populations are related to overall Gulf water quality. Planktonic populations may be affected by discharges from drilling operations, rivers and upland runoff, and shipping activities. Discharges which affect temperature, salinity, turbidity, nutrient, and chemical levels of the water would impact plankton. Due to the circulation and mixing patterns of the Gulf, impacts on plankton from such discharges would be localized. Localized impacts are expected to be short-term due to the short life span of plankton. The incremental effect of the proposed action on plankton will not be significant.

CONCLUSION The cumulative level of impact on plankton is expected to be very low.

(b) Impacts on Benthos

Refer to Section IV.B.4.a.(4)(b) for a discussion of impact factors, and the direct and indirect effects of the proposed action on the benthos.

The live bottom areas of the Eastern Gulf would be affected by the same factors discussed in Section IV.B.4.a.(4)(b). The affects of the proposed action on live bottoms would be the same as those discussed for the benthos of topographic features.

The proposed action will result in a predicted 19 exploratory wells, 36 development wells, and 2 platforms. Based on this scenario, the discharge of an estimated 0.62-55.8 million bbls of formation waters, 0.25 million bbls of drilling muds, and 0.028 million yd. of drill cuttings may be expected to result from the proposed action pipeline related activities would result in the disturbance of up to 0.48 million yd. of sediment. Assuming that nine of the exploratory wells, 15 of the development wells, and one platform are located in proximity to a significant live bottom, the impact to the biota would be severe and perhaps permanent.

Anchoring is inevitably associated with oil and gas activity. Supply boats, pipeline barges, and drilling rigs all may require anchoring. Anchoring from oil and gas activities would cause severe damage to the biota of live bottom areas. Effects to the benthos are not expected to be significant from an oil spill.

CONCLUSION The level of impact to the benthos in general throughout the planning area is expected to be very low; however, in those areas having live bottoms, the impact could be very high.

CUMULATIVE IMPACTS

The major factors contributing to the impact of the benthic environment are anchoring, trawling, dredging, and ocean dumping. Bottom disturbance of soft bottom areas is frequent but usually short-term. Anchoring, trawling, and dredging cause disruption of the substrate and turbidity. Ocean disposal of dredged material smothers the benthos. These areas are usually recolonized quickly, however, often by different benthic species.

These same factors at hard bottom areas can be devastating. Destruction of the benthos is long-term at hard bottom areas. Significant impact has occurred at topographic features due to anchoring.

Oil and gas operations have been significant and are increasing around the topographic features of the Western Gulf. Past operations near topographic features have not had a significant effect on the benthic environment due to the implementation of protective lease stipulations.

CONCLUSION The cumulative level of impact on the benthos is expected to be very high.

(c) Impacts on Fish Resources

Refer to Section IV.B.4.a.(4)(c) for a discussion of impact factors and the direct and indirect effects of the proposed action on fish resources.

One large spill (1,000 bbls or greater) is assumed. A large spill could cause severe, medium-term (1-3 years duration) effects contacting open bays containing finfish and shellfish nursery and/or spawning grounds on fish resources. In addition, a number of smaller spills (less than 1,000 bbls) are assumed. If any of these spills contacts an open bay it is expected to result in localized short-term effects on fish resources.

Approximately 80 miles of new pipelines are expected to result from the proposed action in the Eastern Gulf of Mexico. Pipeline placement activities would have localized impacts on fish resources including destruction of benthic species and fishery habitat and increased turbidity. The impact of pipeline placement is expected to be low.

CONCLUSION The level of expected impact on fish resources is estimated to be low.

CUMULATIVE IMPACTS

Cumulative impacts on fish resources include the impact of the proposed action and impacts related to prior OCS sales and major non-OCS impact producing factors.

One large spill (1,000 bbls or greater) is assumed to occur in the Eastern Gulf of Mexico as a result of Federal OCS and other activities under the Cumulative Scenario. A large spill contacting open bay areas would result in severe medium-term (1-3 years in duration) consequences on invertebrate and vertebrate fisheries and deter fishing. In addition, a number of smaller spill (less than 1,000 bbls) could contact open bays in this area. These spill contacts are expected to result in localized short-term effects on fish resources.

In addition to the 80 miles of pipelines projected for the Eastern Gulf of Mexico from the proposed action, another 350 miles are expected to result from lease sales held in the recent past. The impact of pipeline placement is still expected to be low.

Refer to the Western Gulf of Mexico discussion for information on major non-OCS impact producing factors.

CONCLUSION The impacts resulting from the proposed action, plus the effects of these other factors, may result in a high cumulative impact on fish resources.

(d) Impacts on Marine Mammals

The impact factors and effects on marine mammals in the Eastern Gulf of Mexico planning area are the same as those discussed for the Western planning area, Section IV.B.4.a.(4)(d).

Of the marine mammals discussed in Section III.B.1.b.(4), the bottlenose dolphin is probably the non-endangered marine mammal most vulnerable to OCS-related oil/gas activities based on their population and nearshore habitat (Fritts and Reynolds, 1981; Schmidly, 1981). The West Indian manatee is discussed in endangered and threatened species, Section IV.B.6.a.(4)(f).

One large oil spill (1,000 bbls or greater) and several smaller spills are assumed for this analysis. The probability of a spill occurring is low (about 10%). Recent studies by Geraci and St. Aubin (1985) have indicated dolphins can detect and will avoid oil slicks and that surface contact with oil did not affect their skin. However, the effects of vapor inhalation and ingestion of food contaminated with oil has not been determined. It is estimated that the level of impact to marine mammals from oil spills would be low.

As a result of the proposed action, vessel traffic is estimated to increase about 2%. The level of impact to marine mammals from OCS-related vessel collisions is estimated to be very low.

Up to 55 wells will be drilled, and some seismic exploration will be required over the assumed 20-30 year period of the proposed action. The effect of this disturbance to marine mammals is unknown; however, because it is usually short-term and fairly localized, it is unlikely to cause a major impact on marine mammals.

CONCLUSION The level of expected impact on marine mammals as a result of the proposed action is estimated to be low.

CUMULATIVE IMPACTS

In addition to the impacts discussed previously for the proposed action, impacts from existing Federal OCS oil/gas leases and activities; tankering of petroleum products and foreign crude oil and other commercial, military, and recreational offshore and nearshore activities should be considered as cumulative impacts. Other impacts that are unrelated to OCS activities but could contribute to a cumulative impact on marine mammals include: sound produced by commercial, military, and recreational vessels and aircraft and by commercial and military sonar; natural oil seeps, bilge cleaning, and foreign oil spills; commercial hunting of marine mammals; entrapment, injury, and morality in fishing gear and underwater cables; and ocean disposal of chemicals, radioactive wastes, and munitions.

One large spill (1,000 bbls or greater) and several smaller spills are assumed for this analysis. Deepwater oil/gas exploration and development on the continental slope could affect sperm whales which feed on squid in deepwater areas. The cumulative impact of these factors on the marine mammal population is estimated to be moderate.

OCS-related vessel traffic is estimated to be about 5% of the existing commercial, military, and recreational vessel traffic in the offshore areas inhabited by marine mammals. There are currently 61,000 vessel trips of all types. Seismic exploration will occur on additional lease blocks, and sound will be generated by 378 offshore platforms and numerous supply/crew boats and aircraft. The majority of these disturbances and noises are generally localized around the source and fairly short-term in duration. The cumulative impact from these disturbances and noises on marine mammals is estimated to be low.

CONCLUSION As a result of the proposed action and other activities, the overall cumulative impact on marine mammals is estimated to be low.

(e) Impacts on Coastal and Marine Birds

The impact factors and effects on coastal and marine birds in the Eastern Gulf of Mexico planning area are the same as those discussed for the Western planning area, Section IV.B.4.a.(4)(e).

One large spill (1,000 bbls or greater) and several smaller spills are assumed for this analysis. Many of the coastal and marine birds which are susceptible to oil spills are migratory and could be exposed to oil spills during their overwintering period (October-March).

It is estimated that the level of impact to coastal and marine birds from OCS-related oil spills would be low.

Disturbance of coastal and marine birds nesting and feeding habitat from onshore construction and associated noise from air and vessel traffic could result in a reduction or elimination of birds that use the habitat for feeding or nesting. Dredging, emplacement of pipelines, and the construction of roads could change water flows that may result in damage or destruction of wetland nesting areas.

Affects to coastal and marine bird habitats may result from construction of supply bases in the Eastern Gulf coastal area. The one new estimated support facility will probably be located in developed onshore areas, and it is unlikely that it will affect coastal and marine nesting/feeding habitat. It is estimated that the level of impact to coastal and marine birds from OCS-related air and vessel traffic and onshore construction would be moderate.

CONCLUSION The level of expected impact on coastal and marine birds as a result of the proposed action is estimated to be low.

CUMULATIVE IMPACTS

In addition to the impacts discussed previously for the proposed action, other impacts would result from existing Federal OCS oil/gas leases and activities, and existing oil/gas leases and activities in State tidelands. Impacts which are not related to OCS activities but could contribute to the major cumulative impact on coastal and marine birds would include the loss of nesting and feeding habitat to commercial, military, recreational, and residential construction; potential construction of offshore oil ports or deepwater marine terminals; dredging and draining of wetland areas along migratory flyways and in coastal feeding and overwintering areas; high levels of oil/tar balls from natural seeps, municipal runoff, bilge cleaning, and foreign crude oil spills; entanglement in commercial and recreation fishing gear; collision with electric lines and towers, and coastal storms and hurricanes cause flooding and destruction of nesting areas resulting in bird losses. Agricultural runoff and industrial organic chemicals wastes could cause direct mortality or indirectly cause the loss of food sources for bird species.

One oil spill (1,000 bbls or greater) and a number of smaller spills are assumed for this analysis. The expected level of cumulative impact on coastal and marine birds due to these oil spills is estimated to be moderate.

Disturbance from OCS-related aircraft, boat, and vessel traffic in the vicinity of bird nesting and feeding areas is not expected to increase above current levels. About 90% of the aircraft and vessel traffic in this area is non-OCS-related.

Up to five new pipelines, up to two gas processing plants, up to seven service supply bases, and five other shore facilities may be required along the coast. Cumulative impacts from OCS-related onshore development and support facilities are expected to increase moderately above current levels.

CONCLUSION As a result of the proposed action and other activities described above, the overall cumulative impact on coastal and marine birds is expected to be moderate.

(f) Impacts on Endangered and Threatened Species

The impact factors and effects on endangered and threatened species in the Eastern Gulf of Mexico planning area are the same as those discussed for the Western planning area, Section IV.B.4.a.(4)(f).

In accordance with Section 7(a)(c) of the Endangered Species Act of 1973, as amended, consultations on the proposed Gulf of Mexico OCS lease sales were held with FWS and NMFS. The biological opinions from these agencies (DOI, NMFS, 1985) indicate that leasing and exploration activities associated with these proposals are not likely to jeopardize the continued existence of the listed species considered in the consultations or result in the destruction or adverse modification of their critical habitats. However, FWS indicated that consultation must be reinitiated should any facilities be established along the Gulf coast of Florida south of Tampa Bay. The incidental taking (accidental unavoidable taking) of an endangered species is discussed under Section 7(b)(4)(B) of the 1982 amendments to the Endangered Species Act and is considered during the consultations.

Of the endangered and threatened species discussed in Section III.B.3.b.(6), loggerhead and green turtles and West Indian manatee are probably the species most vulnerable to OCS-related impacts resulting from the proposed action.

Sea Turtles

One large oil spill (1,000 bbls or greater) and several smaller spills are assumed for this analysis. The probability of a spill occurring is low (about 10%). Only a moderate portion of the sea turtle nesting beaches in Florida are exposed to potential oil spills and these beaches experience moderate turtle nesting; therefore, it is unlikely that OCS-related oil spills will affect turtle nesting. However, recent studies have indicated that sea turtles can be severely affected by floating oil/tar balls. It is estimated that the level of impact to sea turtles from oil spills would be moderate.

As a result of the proposed action, OCS-related vessel traffic is estimated to increase about 2%. The incidence of vessel collisions with sea turtles is unknown; however, as no injuries or mortalities have been reported or documented, it is estimated the level of impact to sea turtles from OCS-related vessel collisions is very low.

Up to one oil/gas pipeline landfall is estimated. It is unlikely this pipeline will cross a sea turtle nesting beach. If pipeline emplacement occurs other than during nesting season (June-September), the potential impacts would be negligible.

CONCLUSION The level of expected impact on sea turtles as a result of the proposed action is estimated to be low.

CUMULATIVE IMPACTS

In addition to the impacts discussed previously for the proposed action, impacts from existing Federal OCS oil/gas leases and activities; existing oil/gas leases and activities in State tidelands; tankering of petroleum products and foreign crude oil; and other commercial, military, and recreational offshore and coastal activities should be considered as cumulative impacts.

Impacts that are unrelated to OCS activities but contribute to major cumulative impact on sea turtles include: the loss of nesting beaches to commercial, recreation, and residential development along Florida beaches; high mortality caused by commercial trawling; natural and man-induced predation of turtles and eggs on nesting beaches throughout the Gulf and Caribbean regions; oil/tar balls from natural seeps, bilge cleaning, and tanker spills; compaction of beach areas by vehicles and beach cleaning equipment; incidental capture by commercial longline fishing gear and entanglement in crab pot lines; dumping of contaminated wastes and plastic material into coastal waters; and collision with commercial and recreational vessels.

One large spill (1,000 bbls or greater) and several smaller spills are assumed for this analysis. An unknown number of oil spills could result from oil development in the State tidelands. Also, oil/tar balls from natural seeps, bilge cleaning, and foreign oil spills could contact the Florida coastal area. The cumulative impact of oil spill contacts and other oil contamination is expected to result in a moderate level of impact on marine turtles.

Collisions of OCS-related support vessels with sea turtles could occur in Florida coastal areas; the incidence of collisions has not been documented and is believed to be infrequent. OCS-related vessel traffic is about 2% of the commercial and recreational vessel traffic in Florida waters.

Impacts to sea turtles from OCS-related coastal development and support facilities are expected to be low. Up to five new pipeline landfalls, up to two gas processing facilities, and up to seven service bases may be required; these are unlikely to contact sea turtle nesting/feeding areas. The cumulative effect of OCS-related and non-related facilities are expected to result in a low level of impact on marine turtles.

CONCLUSION As a result of the proposed action and other activities, the overall cumulative impact on sea turtles in the Eastern Gulf is estimated to be moderate.

West Indian Manatee

The West Indian manatee is a marine mammal that feeds on aquatic plants. Their current population is about 800-900 animals concentrated in peninsular Florida. About 350-450 manatees inhabit the rivers, bays, and estuaries of the Florida Gulf coast from Cedar Key south to Key West, Florida. Their critical habitat (41 FR 41914) includes coastal portions of Citrus, Hillsborough, Manatee, Sarasota, Charlotte, DeSoto, Lee, Collier, Monroe and Dade Counties, and other counties along the east coast of Florida.

Manatees could be vulnerable to oil spills reaching their coastal and onshore critical habitat areas. Adverse effects include inhalation or ingestion of oil, skin and eye irritation, and loss of vegetative food sources.

It is unlikely that OCS-related oil spills will affect manatees or their critical habitat. One oil spill is expected to occur, and past environmental analyses indicated a low probability of contacting onshore areas inhabited by manatees.

The primary reason for the endangered status of the manatee is attributed to mortality from collisions with boats and barges. The projected facility expansion and increased offshore support boat traffic in the Tampa Bay and Port Manatee areas could result in boat collisions with manatees. Port Manatee is currently used as a supply base for offshore support boats (about 3-7 trips/week). This boat traffic is about 5% of the annual vessel traffic into the port, and it is projected that support boat traffic could increase 50% of the annual vessel traffic into the port and that support boat traffic could increase 50% as a result of this proposed action (about 5-11 trips/week). The boats follow a marked deepwater channel (34-40 ft in depth) from Port Manatee through Tampa Bay into the Gulf and then proceed to an offshore drill site. While this route does not intrude into the designated critical habitat of the manatees (nearest point is about five miles), it is possible that these boats may encounter manatees during their peak migration in March and November.

CONCLUSION The level of expected impact on West Indian manatees as a result of the proposed action is estimated to be low.

CUMULATIVE IMPACTS

In addition to the impacts discussed previously for the proposal, impacts from existing Federal OCS oil/gas leases and activities; existing oil/gas leases and activities in State tidelands; importation (tankering) of petroleum products and foreign crude oil; and other commercial, military, and recreational offshore and coastal activities should be considered as cumulative impacts.

The expected cumulative number of oil spills from the proposed action, existing OCS leases, and imports is one spill greater than 1,000 bbls. The cumulative impact of oil spills is expected to cause a low level of impact on manatees. About 60% of non-OCS related boat traffic is in coastal areas inhabited by manatees; this would increase the probability of boat collisions with these animals. The cumulative impact of this vessel traffic is expected to cause a moderate level impact on manatees in the Eastern Gulf area.

Up to eight oil/gas pipeline landfalls and up to seven onshore facilities may be constructed under the cumulative scenario. The proposed OCS-related construction would require a small amount of coastal area suitable for manatee habitat that currently is being utilized for the construction of non-OCS-related commercial and residential structures in the coastal zone. Loss of habitat is a serious problem for manatees in this area. It is expected that the majority of the OCS-related onshore construction would occur in developed areas. The cumulative impact of this onshore construction is expected to cause a low level of impact on manatees in the Eastern Gulf area.

CONCLUSION As a result of this proposed action and other activities, the overall cumulative impact on manatees in the Eastern Gulf is expected to be moderate.

(g) Impacts on Seagrasses and Wetlands

The impact factors and effects on seagrasses and wetlands in the Eastern Gulf of Mexico planning area are the same as those discussed for the Western planning area, Section IV.B.4.a.(4)(g).

Seagrasses

There are about 121,296 acres of unexposed and 3,225,248 acres of exposed seagrass areas in the Eastern Gulf of Mexico coastal area. Oil spills which contact seagrasses in intertidal areas can result in extensive and long-term (1-3 years) damage. However, as most seagrass areas are subtidal, oil spills usually only contact and damage those areas which are exposed to tidal influences.

One large oil spill (1,000 bbls or greater) and several smaller spills are assumed for this analysis. The probability of a spill occurring is low (about 10%). The major portion of the seagrass areas could be exposed to potential offshore oil spills; it is estimated that the level of impact to seagrasses from oil spills would be low.

No oil/gas pipeline landfalls, no new navigation channels, and an undetermined amount of maintenance dredging of existing navigation canals are estimated. For this analysis the assumption is made that one mile of navigational canal dredging could damage or destroy up to six acres of seagrasses.

It is estimated that up to 18 acres of seagrasses could be damaged or destroyed in maintenance dredging. This represents a loss of up to less than 0.01% of the total seagrasses. This would indicate a very low level of impact to seagrasses.

CONCLUSION The level of expected impact on coastal seagrasses as a result of the proposed action is estimated to be low.

CUMULATIVE IMPACTS

In addition to the impacts described for the proposed action, impacts from existing Federal OCS oil/gas leases and activities; existing oil/gas leases and activities in State tidelands; barging and tankering of foreign crude oil and petroleum products; canalization and maintenance dredging; commercial and recreational trawling; commercial, military, and recreational boat and vessel traffic; agricultural, industrial, and municipal effluents; and coastal storms and hurricanes all impact coastal seagrass beds to some extent. Few of these impact producing factors can be quantified.

One large oil spill (1,000 bbls or greater) and several smaller spills are assumed for this analysis. The probability of a spill occurring is high (about 56%). There is a potential for some of these oil spills to occur nearshore or inshore from barges, tankers, or pipelines, which could cause extensive damage to intertidal seagrasses in the vicinity of the spill site.

A major portion of the seagrass areas could be exposed to potential oil spills. It is estimated that the cumulative level of impact to seagrasses from oil spills would be low.

Most of the dredging for pipeline canals and navigational channels in the coastal waters, where seagrasses occur, damage or destroy some seagrasses. The extent of damage depends on several factors, such as: location, substrate, seagrass species, wave action, etc. Maintenance dredging of inlets and navigational channels is an ongoing process in the coastal area. Where pipeline canals and navigational channels intersect the coastline, barrier islands, or estuarine areas there are usually seagrass areas that could be damaged.

Up to eight new pipeline landfalls, up to seven new onshore facilities, one new navigation channel, and an undetermined amount of maintenance dredging of existing navigation channels are estimated. It is estimated that up to 144 acres of seagrasses could be damaged or destroyed in the vicinity of the pipeline landfalls and this dredging activity. This represents a loss of less than 0.01% of the total seagrasses. This would indicate a very low cumulative level of impact to seagrasses from OCS oil/gas-related activities.

Although other construction activities in the coastal area may not directly impact seagrasses, there may be an indirect impact of sedimentation and increased effluents of organic chemicals which may damage or destroy seagrasses in the coastal area. Trawling, vessel traffic, and coastal storms cause wave action, water turbulence, and turbidity which can damage seagrasses. The cumulative impact of these activities on seagrasses is estimated to be low.

CONCLUSION The overall cumulative level of impact to seagrasses is estimated to be low.

Wetlands

There are about 1,432,067 acres of non-forested wetlands. The wetlands exposed to potential oil spills consist of about 238 miles of coastal wetlands (about 12% of the coastal wetlands). For this analysis one large oil spill (1,000 bbls or greater) and several smaller spills are assumed to occur. As about one-eighth of the coastal wetlands are exposed to potential oil spills, it is estimated that the level of impact to wetlands from oil spills would be low.

No oil/gas pipeline landfalls, no onshore facilities, no new navigation channels, and an undetermined amount of maintenance dredging of existing navigation channels are estimated.

For this analysis the assumption is made that onshore emplacement of one mile of pipeline or one mile of canal could damage or destroy up to 12 acres of coastal wetlands. Estimates of the average acreages used for new onshore infrastructure/support facilities considered in the analysis are as follows: exploratory drilling service base - 15 acres; development/production service base - 75 acres; pipeline installation service base - 5 acres; pipe coating yard - 150 acres; pipelines per mile - 12 acres; platform fabrication yard - 400 acres; gas processing plant - 75 acres; and marine terminal - 30 acres.

It is estimated that up to 75 acres of coastal wetlands could be damaged or destroyed as a result of onshore facility construction and maintenance dredging. This represents a loss of less than 0.01% of the total wetlands and would indicate a very low level of impact to wetlands.

CONCLUSION The level of expected impact on coastal wetlands as a result of the proposed action is estimated to be low.

CUMULATIVE IMPACTS

In addition to the impacts described for the proposed action, impacts from existing Federal OCS oil/gas leases and activities; existing oil/gas activities in State tidelands; barging and tankering of foreign crude oil and petroleum products; canalization and maintenance dredging; commercial, military, and recreational boat and vessel traffic; residential, urban, and industrial development; agricultural, industrial, and municipal effluents; and coastal storms and hurricanes all impact coastal wetlands to some extent. Few of these impact producing factors can be quantified. Submergence increases the depth, periodicity, and in some cases duration of given levels of salinity. Development replaces the coastal wetlands with upland habitats. Wave erosion replaces the non-forested emergent wetlands with open water.

One large oil spill (1,000 bbls or greater) and several smaller spills are assumed for this analysis. The probability of a spill occurring is high (about 56%). There is a potential for some of these oil spills to occur nearshore or inshore from barges, tankers, or pipelines which could cause extensive damage to coastal wetlands in the vicinity of an oil spill site. Only a limited portion of the coastal wetlands would be exposed to a potential oil spill incident. It is estimated that the cumulative level of impact to coastal wetlands from oil spills would be moderate.

Most of the pipeline canals, navigational channels, maintenance, dredging activities, and construction of onshore facilities in coastal areas, where wetlands occur, damage or destroy some wetlands.

Up to eight new pipeline landfalls, one new navigation channel, up to seven new onshore facilities, and an undetermined amount of maintenance dredging of existing navigation channels are estimated. It is estimated that up to 1,175 acres of coastal wetlands could be damaged or destroyed as a result of these activities. This represents a loss of up to 0.1% of the total wetlands and would indicate a moderate level of impact.

Other construction and development activities in the coastal area may have direct and indirect impacts on wetlands. A direct loss of wetland by dredging and draining converts wetlands to uplands.

CONCLUSION The overall cumulative level of impact to wetlands is estimated to be high.

(h) Impacts on Areas of Special Concern

The potential causes of adverse impacts to offshore living resources from these proposals are oil spills impinging on the resource; mechancial damage to organisms (and their habitat) due to drilling, anchors, pipeline and platform emplacement, and smothering by drilling fluids or cuttings; toxicity to organisms of drilling fluids components; and mechanical damage due to blowouts.

Direct and Indirect Impacts

All the offshore resources of concern may be at risk from drilling muds and cuttings discharges during drilling operations and to mechanical damagem from construction activities. While the impacts from these activities are generally quite localized in extent, the damage caused by these activities to unique and productive communities, such as coral reefs and live bottoms, can be quite severe.

In addition to toxic effects, the discharges, particularly the currings, form a low mound on the bottom beneath the discharge. Approximately 511-951 cu. yd. of cuttings are disposed of during the drilling of an exploration well, depending on the depth of the well. Nomotile plants and animals covered by this mound may be smothered, and to the extent that this mound exhibits different substrate characteristics (such as grain size, organic content, etc.) from the original bottom, the plants and animals which colonize the mound will be different. However, observations on such mounds show that they are colonized and reworked, and that after some period of time become indistinguishable from the surrounding bottom (Zingula, 1975). Furthermore, Menzie(1983) points out that it is the physical change of the substrate rather than any toxic effects which causes a change of benthic fauna around drilling rigs.

All the above notwithstanding, the direct discharge of muds and cuttings on small and productive areas such as coral reefs and live bottoms would devastate delicate ecological relationships and the resulting change in sediment characteristics would prevent recovery of the pre-drilling condition.

Considerable mechanical damage will be inflicted upon the bottom by normal and routine oil and gas operations. The drilling itself disturbs some small areas. Anchors from support boats and ships, floating drilling units, and pipeline laying vessels do a great deal of damage to live bottoms and corals. The area actually affected will depend on depth of water, length of chain, size of chain, wind, and current, but severe damage to sensitive communities can occur within the area. Pipeline emplacement also causes considerable disruption to the bottom. It is estimated that six acres of the bottom is physically disturbed per mile of pipeline laid: some 2,300-6,000 cu. yd. of sediment are resuspended per mile of pipeline, depending on the size of the pipeline and depth of trenching *burial). Add to this damage caused by the eight anchors of the pipelaying barge and it is clear that considerable damage will be done if such activities are conducted in sensitive coral or live bottom areas.

Of the offshore resources only seagrass beds are expected to be threatened by oil spills. The florida Middle Ground and other live bottom areas are not expected to be at risk from oil spills because of the water depth (i.e., greater than 10m) at which these areas are found. Only a large spill would offer any signficant potential threat to biosensitive areas.

The ecology of seagrass beds may be severely disrupted by oil spills reaching such areas. A major spill reaching these areas within 10 days could devastate large areas of seagrass communities, which could in turn severely damage fish populations important to both commercial and recreational fisheries. Thus, there is a potential for very high impacts to seagrass beds due to oil spills.

As indicated above, oil and gas operations may cause severe mechanical damage to the relatively small coral and live bottom areas of the Eastern Gulf of Mexico and thus could have a very high impact on these areas, assuming the operations take place on or near these important and sensitive habitats. The most sensitive and well known of these areas is the Florida Middle Ground. If complete loss were to occur in these areas for whatever reason, recovery may never take place; in any event, recovery time will be in terms of years. Loss of such areas may have severe and long lasting deleterious consequences on the specific commercial and recreational fisheries habitats affected. Furthermore, these areas have intrinstic biological, ecological, and aesthetic values of their own which could be lost by such activities.

This proposal is expected to result in the drilling of 19 exploratory wells and the construction of two platforms and the drilling of 36 development and production wells. This would result in the production of at least 250 thousand barrels of drill muds and over 7,000 barrels of cuttings. Should any of the exploratory wells on platforms be located an or near areas of special concern, damage to the biological communities in these areas could occur from anchoring of drill ships and service vessels, from the constructions of the platforms as by the effects of drill mud or cuttings coming into contact with organisms within the line bottom communities. If there are oil spill greater than 1000 barrels which could occur as a result of the proposal was to contact are of the sensitive areas, damage as described above could occur.

CONCLUSION The level of impact to areas of special concern could be very high. However, see section IV.B.a.(6) which discusses the deferrel of the Middle Gounds and seagrass beds subareas from this 5-year program.

CUMULATIVE IMPACTS

The majors factors contributing to impacts on areas of special concern are anchoring, trawling, materials disposal and ocan dumping. Bottom disturbance of live bottom areas as seagrasses is usually short term and caused mostly by the anchoring of ocean going vessels, fishing vessels and pleasure craft, or by the dragging of fishing gear along the bottom. Anchoring and trawling cause disruption of the substrate and sp while ocean dumpting of dredged materials another benthic organisms locally. Distrubid areas tend to recolonize quickly althrough often with different benthic species. As shipping activity and fishing continues, disturbance from those sounds along with damage from oil and gas activity could be expected to have a very high impact.

CONCLUSION The cumulative level of impact on areas of special concern is expected to be very high.

(i) impacts to Marine Sanctuaries

There are no designted marine sanctuaries in the Eastern Gulf of Mexico.

(5) Socioeconomic Environment

(a) Impacts on Employment and Demographic Conditions

This analysis is based on projections made both with and without the proposed Eastern Gulf sales. Employment projections with the proposed lease sales are based on the well drilling, platform, and pipeline requirements estimated for the proposed action. Employment projections without the proposed Eastern Gulf sales assume no sales after 1985. Those without sale projections are used for comparative analysis.

SIC 13 employment has generally been minimal in comparison to other Gulf of Mexico OCS areas. In fact, at the time of the first areawide OCS lease sale (Sale 79 in January 1984), there was no active drilling in Federal OCS waters of the area. All SIC employment occurred in the onshore coastal region or in State offshore waters. However, lease awards from Sale 79 and proposed Sale 94 have and are expected to result in increased drilling activity in Federal OCS waters.

The proposed sales are expected to result in OCS-generated employment over the 1990-2013 period, inclusive. Not all of this sale-related employment, however, will be associated with Eastern coastal subareas. Oil and gas activity in offshore areas will be supported in part from coastal subareas in the Central Gulf.

Employment that does result allows a continuation and, from 1990-1991, an expansion of employment associated with Sale 79 and proposed Sale 94. Employment (direct, secondary, and induced) resulting from the proposed sales will peak in 2000 at about 400 jobs.

However, new resident employment, which is an expansion of employment generated by the previous areawide sales, will occur over the 1990-1992 period.

New resident employment, payroll, and population generated by the proposed sales are expected to peak in 1990 at about 150 jobs, $3 million, and 300 persons, respectively. This new resident employment, payroll, and population represents less than 1% of total employment, payroll, and population for the affected subareas in 1990 under the assumption of no future lease sales. The employment generated is not considered to be new resident. This employment will serve to mitigate the unemployment in these coastal subareas as well as to maintain the level of the existing labor force.

CONCLUSION The impact to the Eastern coastal region from the proposed sales is expected to be very low.

CUMULATIVE IMPACTS

The cumulative impact analysis is based on the expectations of the proposed actions in the Gulf of Mexico, as well as the projected effects of past leasing and other existing employment producing activities (in all industries). These aggregate indicators of economic activity have been projected by MMS on the basis of growth trends for SMSA's and other substate regions prepared by USDC.

Total employment, income, and population in the coastal region is expected to grow throughout the next 10 years at an average rate of 1% annually in the Central Gulf and 1.5% annually in the Eastern Gulf, even without additional OCS oil and gas lease sales. The proposed actions will have a negligible effect on these total average annual growth rates since these sales are expected to result in much less than 1% growth in economic activity in each affected coastal subarea, as previously discussed in this report.

CONCLUSION The cumulative impact will be an average annual growth rate of about 1.5% in the Eastern Gulf, which is considered low.

(b) Impacts on Coastal Land Use

Refer to Section IV.B.4.a.(5)(b) for a discussion of impact factors, and the direct and indirect effects of the proposed action on coastal land use.

Onshore support and processing services for offshore drilling and production under the proposed action are estimated to be provided in part from existing facilities in Louisiana, Mississippi, and Alabama, particularly gas processing and oil refining. Much of this infrastructure currently has unused or readily expandable capacity.

Estimates include up to four new service bases in support of exploratory drilling and development/production activity. The West Florida Regional Planning Council (1983) has indicated that suitable sites are available in Bay County (at Watson Bayou) and Escambia County (at Bayou Chico) to support oil and gas activity. The Tampa Bay Regional Planning Council (1982) identified the Port Manatee, Hookers Point, Port Sutton, and Big Bend/Port Redwing port/industrial areas as suitable locations for service bases, marine terminals, and other OCS support facilities requiring port locations.

CONCLUSION Impact on state and local land use will be very low.

CUMULATIVE IMPACTS

Cumulative impacts on state and local land use include the impacts of the proposed action as discussed above, plus impacts related to prior OCS sales and to major non-OCS impact producing factors affecting the coastal area.

Estimated facilities construction resulting from prior OCS sales are as follows: seven service bases; two pipe coating yards; eight pipeline landfalls; no platform fabrication yards; and four gas processing plants.

Non-OCS factors include all those activities which can cause potentially major impacts to, or conflicts with, the policies, objectives, and regulatory requirements/guidelines of local land use plans and CZM programs. Broadly stated, these activities include residential, commercial, industrial, agricultural, institutional, recreational, energy, and transportation facilities, and other development.

CONCLUSION Impact on state and local land use would be low.

(c) Impacts on Water Supply

Refer to Section IV.B.4.a.(5)(c) for a discussion of impact factors and the direct and indirect effects of the proposed action on water supply.

Increased demands on coastal water resources in the Eastern Gulf may be expected to occur as a result of increased OCS activities. Changes in population and increased industrial activities may result in association with expanded OCS support activities resulting from the proposal. Based on MMS estimates an estimated water consumption of 57.0 million gallons can be expected in association with offshore drilling activities alone. Supply bases could use as much as 5.2-8.2 million gallons of freshwater/rig-platform/year with 460,000 gallons being potable. Additional water uses would come from onshore support activities in the Central Gulf associated with gas processing, refining, and platform fabricaion Projected peak (1996) new population growth associated with the proposed action is estimated to be minimal (300 persons) and distributed over four counties, thus resulting in insignificant increases in local water usage and very low impacts as a result of population increases associated with the proposed action. Temporary, moderate impacts of a localized nature could be experienced, particula in areas currently experiencing water supply shortages.

CONCLUSION Any stress to local water supplies would be of a temporary nature and the expected impacts on the regional water supply are low.

CUMULATIVE IMPACTS

In addition to those impacts discussed above resulting from the proposed action, the addition of up to 7 new service bases, 4 new gas processing plants, 13 platforms, 131 exploration/delineation wells, and 247 production wells will impact area water supplies as a result of prior OCS-related activities. These impacts to water supply will add to the increased burdens on existing water resources. Mitigation of water supply-related impacts will require prudent site selection of these proposed onshore and support facilities in areas known to possess ample surface and groundwater supplies at present, and with water resource conservation and development plans for the future.

OCS-generated new resident population would be distributed over four counties and could account for increased demands for residential water usage ranging from less than 0.05% to as high as 5%-7%. Overall, these OCS-generated cumulative demands are expected to have a low impact on the water supply of the potentially affected area. However, the overall cumulative impact which includes the effect of non-OCS population and industrial growth is expected to be high to very high.

It should be noted that Florida has undergone rapid population growth during the last decade, increasing from 6.8 million to 9.7 million from 1970-1980 (Florida, University of, 1981). This growth has increased the competition among users of water for all purposes.

CONCLUSION The OCS-generated cumulative demands are expected to have a low impact on regional water supplies However, the overall cumulative impact, which includes the effect of non-OCS population and industrial growth, is expected to be very high.

(d) Impacts on Commercial Fisheries

Refer to Section IV.B.4.a.(5)(d) for a discussion of impact factors and the direct and indirect effects of the proposed action or commercial fisheries.

From 1972-1976 approximately 349.2 million lbs/yr of finfish and shellfish with a dockside value of $92.6 million were caught in the Eastern Gulf of Mexico. Two platforms are expected under the proposed action eliminating less than 0.1% (6-10 acres) of the trawling area. One large spill (1,000 bbls or greater)is assumed for this area. A large spill contact could cause severe, medium-term (1-3 years duration) effects on fisheries. In addition, a number of smaller spills (less than 1,000 bbls) are assumed in this area. Small spill contacts are expected to result in localized short-term effects on fish resources.

CONCLUSION As a result of the effects of oil spills on spawning and nursery areas the level of expected impact on the commercial fishing industry is estimated to be moderate.

CUMULATIVE IMPACTS

Cumulative impacts on commercial fisheries include the impact of the proposed action, impacts related to prior OCS sales, and major non-OCS impact producing factors.

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In addition to the 2 platforms projected for the Eastern Gulf of Mexico from the proposed action, another 10 are expected to result from lease sales held in the recent past. The total area lost to trawling (36-60 acres) would still represent less than 0.1% of the trawling area.

One large spill (1,000 bbls or greater) is assumed to occur as a result of Federal OCS and other activities under the cumulative scenario. A large spill contacting open bay areas could result in severe medium-term (1-3 years in duration) consequences on invertebrate and vertebrate fisheries and deter fishing. In addition, a number of smaller spills (less than 1,000 bbls) are assumed.

in this area. Small spill contacts are expected to result in localized short-term effects on fish resources.

Shrimp trawling operations take large numbers of juveniles of commercially and recreationally important species. Conflicts between gillnetters and hook-and-line fishermen occur in the mackerel fisheries. Also, conflicts occur between shrimp trawlers and the stone crab and spiny lobster fishermen off southwest Florida. Refer to Western Gulf of Mexico discussion for additional information on major non-OCS impact producing factors.

CONCLUSION The impacts resulting from the proposed action, plus the effects of these other factors, added to the widely varying baseline conditions resulting from natural environmental factors, may result in a high cumulative impact on the commercial fishing industry.

(e) Impacts on Recreation and Tourism

Refer to Section IV.B.4.a.(5)(e) for a discussion of impact factors and the direct and indirect effects of the proposed action on recreation and tourism.

Continued OCS leasing over the next five years under the proposed alternative will result in the likely installation of only two production platforms off the coast of Florida. These platforms and the prerequisite exploratory drilling rigs are likely to be far from shore and have no detectable impact on the recreation and tourism industry of Florida. Should the commercial finds be within 10-15 miles of major shorefront recreational areas or coastal resort areas extending along the northwest or southwest coast of Florida, the offshore structures necessary for exploration and production will be barely visible and will hardly detract from seashore viewsheds. Such structures would have no adverse effect on the level of recreation and tourism activity. Production platforms situated within 25 miles of major population centers and coastal fishing communities are likely to become very popular fishing locations.

With a commercial discovery of oil or gas, a transmission pipeline is likely to be constructed. The resulting landfall, or where the pipeline comes ashore, will temporarily and locally impact use and aesthetics of recreation and tourist lands directly associated with the path of the pipeline construction site. As pipelines are planned developments associated with OCS product transmission needs, it is highly unlikely projected landfalls would reduce the level or quality of recreation or tourist activity anywhere in the area.

Should an accident from exploration, production, or transmission facilities result in oil coming ashore along a major shorefront recreational beach in Florida, localized and short-term impacts on recreation and tourism are likely to occur. Indirect impacts or cleanup and containment of an oil spill on a sandy beach can be more damaging and lasting than the effects of the spill alone. Offshore leasing can lead to trash and debris entering the Gulf from oil and gas operations and accidents.

Although the levels of activity likely to result from the expected leasing from the proposed alternatives is unlikely to cause widespread littering on Florida beaches or increased maintenance efforts, some oil and gas trash may impact some Florida beaches and will contribute to the overall level of flotsam and jetsam currently in the Gulf of Mexico.

CONCLUSION Continued OCS leasing for the next five years under the proposed alternatives is expected to result in a very low impact on recreation and tourism.

CULUMATIVE IMPACTS

Cumulative impacts will result from the combined action of former and future leasing on the Federal OCS, State oil and gas leasing, and other activities such as shareline construction, planned onshore development. Through the year 2000 as many as 13 production platforms may be producing oil and gas in the Eastern Gulf of Mexico. Although drilling rigs and platforms operating in State territorial waters may introduce distraction in offshore viewsheds near major beach and resort areas, the marginal change contributed by additional OCS structures will be negligible, if apparent.

The level of crude oil developed and imported within the Gulf of Mexico is unlikely to decline; however, adoption of the proposed action will slightly increase the risk of oil pollution adversely affecting Florida's recreation and tourism industries on a localized and temporary basis. Although a minimal increase in trash and debris floating onshore from the Gulf of Mexico can be expected, it is unlikely to have any effect on beach maintenance programs or to affect the use of recreation or tourist areas anywhere along Florida's coastline.

CONCLUSION Planned development and accidents associated with continued development and use of the Gulf of Mexico, including the additional leasing projected under the proposed alternative, is expected to have a very low impact on recreation and tourism.

(f) Impacts on Archaeological Resources

The impact factors and effects for archaeological resources are discussed in Section IV.B.4.a.(5)(f).

Historic
Since information contained in historical sites is often unrecorded in written historical accounts, physical alteration or destruction of complete sites or site components may result in the loss of information on our nation's maritime and cultural heritage. Contamination of coastal historic sites by an oil spill would cause a temporary and reversible impact on the aesthetics of the site, but no loss of historical information.

Therefore, although there is the potential for a loss of significant historic archaeological data should a direct interaction occur between an impact producing factor and an historic shipwreck, due to the low amount of acreage which would be disturbed relative to the total amount of unleased acreage in the Eastern Gulf, the potential for such an interaction occurring is assessed as being low.

There would be a maximum of 45 acres disturbed by onshore development. Due to the low amount of acreage projected for disturbance, the visibility of most onshore historic sites and State and Federal cultural resource laws which require consideration of historic properties if any State or Federal funding or permits are required for construction, the expected impact to coastal historic sites in the EPA as a result of the projected onshore development associated with the proposed action is very low.

One large spill (1,000 bbls or greater) and several smaller oil spill contacts are assumed for this analysis. Should one or more of these spill contacts be with a coastal historic site such as forts and lighthouses, the major impact would be visual due to oil contamination of the site and its environment. This impact would probably be temporary and reversible with no actual loss of information.

CONCLUSION The expected level of impacts to historic archaeological resources is low.

CUMULATIVE IMPACTS

Other major factors which would affect significant historic archaeological resources in the Eastern Gulf include trawling, sport diving/commercial treasure hunting, hurricanes, channel dredging, and chronic, low-level hydrocarbon contamination.

Of these factors, commercial treasure hunting, hurricanes, and channel dredging are assessed as having a high potential for causing loss of significant historic archaeological data. The most intensive areas of trawling in the Gulf are represented by the centers of abundance for white shrimp. Extensie trawling within these areas would probably only affect the upper 3 inches or so of sediment (NERBC, 1980). Any shipwreck site components within 3 inches of the present seabed probably would be affected should the area be trawled. On many wrecks, this zone would already be disturbed by natural factors and would contain only artificats of low specific gravity which have lost all original context and have been heavily abraded (Muckelroy, 1978). Therefore, the effect of trawling on most historic shipwreck sites would probably be very low.

Sport diving and commercial treasure hunting are a significant factor in the loss of historic data from wreck sites. While commercial treasure hunters generally impact wrecks with intrinsic monetary value, sport divers may collect souvenirs from all types of wrecks. The impact from these activities cannot be quantified.

About half of the coast along the Central Gulf was hit with 16-20 tropical cyclones between the years 1901-1955 (DeWald, 1980). The other half, between Atchafalaya Bay, Louisiana, and Texas, had a slightly lower incidence of cyclones (11-15). Seven major hurricanes also crossed the Central Gulf between the years 1954-1977. Shipwrecks in shallow waters are exposed to a greatly intensified longshore current during tropical storms (Clausen and Arnold, 1975). Under such conditions, it is highly likely that artifacts of low specific gravities would be dispersed, leaving only the denser materials at the original site. Some of the original informatio contained in the site would be lost in this process, but a significant amount of information would also remain. A signficant loss of data from historic sites has probably occurred, and will continue to occur, in the Gulf from the effects of tropical storms. Assuming that some of the data lost has been unique, this impact would be very high.

Because most channel dredging occurs at entrances to bays, harbors and ports, there is a high probability for impacts to historic sites because of high site densities in these areas. Assuming that some of the data lost have been unique, the impact to historic sites as a result of past channel dredging activities, would be very high.

CONCLUSION The cumulative impact to the historic archaeological resources base in the Eastern Gulf is assessed as being very high.

Prehistoric

Any in situ prehistoric site located on the Gulf of Mexico OCS would be completely unique. As sites are discovered, those along relict shorelines, seaward of about the 20 m isobath, will provide unique archaeological data on coastal adaptations prior to the Late Archaic period. Such information is unavailable from terrestrial sites in North America because coastal areas for all cultural periods prior to the Late Archaic are currently submerged on our continental shelves. Archaeological data on prehistoric migrations, settlement patterns, and cultural contacts across now submerged land masses is also information which can only be obtained from submerged sites on the OCS.

Physical alteration or destruction of complete sites or site components may result in the loss of archaeological data on prehistoric migrations, settlement patterns, subsistence strategies, and cultural contacts for North America, Central America, South America, and the Caribbean.

There may be up to of 45 acres disturbed by onshore development. Due to the low amount of acreage projected for disturbance and State and

Federal cultural resource laws which require consideration of cultural resources if any State or Federal funding or permits are required for construction, the expected impact to coastal prehistoric sites as a result of the projected onshore development associated with the proposed action is very low.

One large spill (1,000 bbls or greater) and several smaller oil spill contacts are assumed for this analysis. Should one or more of these spill contacts be with a coastal prehistoric site, the potential for dating the site using Carbon-14 would be destroyed. However, if diagnostic artifacts are present in the site, loss of C-14 dating potential may not constitute a loss of unique information.

CONCLUSION The expected level of impact of prehistoric archaeological resources is low.

CUMULATIVE IMPACTS

Other major factors which would affect significant prehistoric archaeological resources in the Eastern Gulf include trawling, hurricanes, channel dredging, previous oil and gas development, and chronic, low-level hydrocarbon contamination.

Of these factors, hurricanes, and channel dredging, and chronic, low-level hydrocarbon contamination are assessed as having a high potential for causing loss of significant prehistoric archaeological data. Extensive trawling within shrimping areas would probably only affect the upper 3 inches or so of sediment NERBC, 1980). Due to the limited vertical extent of disturbance associated with trawling, it is unlikely that any prehistoric sites would be affected.

Storms could affect coastal prehistoric sites on barrier islands and beach fronts by erosion and reworking of sediments which would either destroy or change the context of site components. When the number of tropical storms recorded within this century is multiplied by 30 (for sites approximately 3,000 years old), it seems highly likely that many exposed coastal prehistoric sites have been, unique, this impact would be very high.

Because most channel dredging occurs at entrances to bays, harbors and ports, there is a high probability for impacts to prehistoric sites because of high site densities in these areas. Assuming that some of the data lost have been unique, the impact to prehistoric sites, as a result of past channel dredging activities, would be very high.

CONCLUSION The cumulative impact to the prehistoric archaeological resources base in the Eastern Gulf from impact producing factors is assessed as being very high.

(g) Impacts on Marine Transportation and Ports

A description of impact factors and direct and indirect effects associated with marine transportation and ports may be found in Section IV.B.4.a.(5)(g).

There has been comparatively little oil and gas exploration and no production in the area. If major discoveries are made in the area, the levels of activity would be greatly increased. The number of vessel trips made in 1982 from Eastern Gulf ports amounted to about 11% of that for the entire Gulf coast region.

OCS-related vessel traffic is expected to increase by just over 1%, or 800 trips, in the peak year of activity over the current annual level of over 61,000 trips associated with oil and gas and all other activities. Only two structures are expected to be emplaced as a result of the proposed action. It is unlikely that these structures will be a significant hazard to navigation if regulations requiring adequate marking are adhered to and if locations are made known to mariners.

CONCLUSION Increased vessel traffic expected in the peak year of activity and structures resulting from the proposed action indicate that impacts or affected marine transportation and ports will be very low.

CUMULATIVE IMPACTS

Cumulative impact producing factors considered in this analysis include those related to the proposed action, prior OCS traffic, and non-OCS-related marine traffic.

The impact analysis for the proposed action is based on expected increases in OCS-related vessel traffic over existing traffic levels. These existing levels include all known potential impact producing factors, with the exception of the expected impacts associated with future exploration, development, and production associated with prior sales.

Future OCS activities associated with prior sales and the proposed action are expected to increase vessel traffic levels by 9% or 5,500 trips in the peak year of activity over the current annual level of over 61,000 trips.

The development of infrastructure related to prior OCS sales is expected to result in the emplacement of 13 structures. This development will be paced over 8 years which should allow traffic to adapt to the presence of structures in areas that had no previous obstructions. Current regulations and adequate notice to mariners should mitigate most problems.

CONCLUSION Increased vessel traffic, structures, and all other potential impact producing factors indicate that during the peak year of activity the cumulative impacts on marine transportation and ports will be very low.

(h) Impacts on Military Uses

Forty-six percent, or 27,049,000 acres, of the water and air space of the Eastern Gulf is used for the various military operations within five warning areas. An additional 50% of the Eastern Gulf is included in the Eglin water test areas.

All three services make extensive use of the military areas for training and testing of personnel and equipment.

The placement of oil and gas exploration rigs and platforms, and the traffic of service vessels into a warning areas can have an impact on the numbers of planes and/or ships to be involved in particular missions and can have an impact on the spatial extent of a plane's or ship's performance of a nameuver.

The impacts of oil and gas activities will be higher within those areas with continuous use as opposed to the areas with intermittent use. However, it is unlikely that oil and gas activities will alter the frequency of Navy and Air Force use in any of the warning areas.

Conflicts between DOD operations and oil and gas activity have been most severe in W-155 where consultation between DOI and DOD brought about a boundary adjustment of the area.

The level of activity expected to result from the proposal should not affect activity in any given area to the extent that military operations would be affected except for occasional short-term delays.

Navy and Air Force operations within a warning area or water test area can have an impact on oil and gas development, and they are a possible threat to life and eq
euipment related to oil and gas development

CONCLUSION The overall impact of oil and gas activities on military operations are expected to be low.

CUMULATIVE IMPACTS

Cumulative impacts will relate to oil and gas development related to past sales, the proposed, and present trans-Gulf vessel traffic and commercial and recreational fishing to and from Eastern Gulf ports.

The cumulative number of service vessel trips and helicopter flights may conflict with military operations in some areas, and the increasing number of exploration rigs and their different drilling locations may restrict, curtail, or shift military missions or maneuvers in warning areas or in the water test areas. In addition to the impacts from oil and gas activities, ocean-going vessel traffic and commercial and recreational fishermen and boaters impact the military operations very little in the Eastern Gulf.

Since there is no oil and gas development in the Eastern Gulf, virtually all of the vessel traffic entering and exiting ports in the Eastern Gulf comes from other sources. It is unlikely that many small boat fishermen will venture into the water test areas due to their distance from shore and water depth.

All air traffic is controlled by the FAA, which prohibits civilian traffic into the warning and water test areas during periods of activity and reroutes traffic around the areas, if necessary.

The number of and area covered by the military missions within the warning areas and water test areas is an important factor that impacts the joint use of the areas. If the military continues to accelerate their use and aerial coverage of the warning areas and water test areas over the next several years, as they have for the past four years, seismic conflicts may result causing the military to curtail operations or deem it necessary to impose further restrictions on oil and gas development.

CONCLUSION The cumulative impacts of past sales, the proposal and projected ocean-going vessel traffic and from commercial and recreational fishing are expected to be moderate.

(6) Subarea Deferrals

Two subareas in the Eastern Gulf of Mexico planning area are proposed to be deferred from leasing in the 5-year program.

(a) Seagrass Beds Offshore Florida

This subarea consists of 186 blocks in the area of seagrass beds offshore the west coast of Florida. The subarea contains approximately 1.07 million acres lying offshore from Wakulla to Pasco Counties. It extends southeastward from 9 miles off the coast of Florida to approximately 25 miles offshore in water depths up to 10 meters. Extensive seagrass beds inhabit the Florida Big Bend offshore area. These seagrasses are comprised predominantly of Thalassia testudinum, Syringodium filiforme, and Halophila spp. The actual extent of the seagrass beds is unknown at present; however, an MMS funded study is nearing completion which would help define the extent of these seagrass beds. These seagrass beds are important to the overall ecology of the Eastern Gulf of Mexico and support numerous commercially and recreationally important fishery and wildlife species. The coastal area surrounding the subarea is densely vegetated with salt marsh. This coastal area is important to the fish and wildlife species of the area.

Deferral of this subarea would preclude impacts to the seagrass areas from oil and gas drilling operations. Discharge of drill muds and cuttings directly on the seagrasses, causing smothering and potential long-term denuding of the area surrounding the drilling activity would be avoided. Direct physical impact of rig emplacement and anchoring of supply boats would also be avoided. Deferral of the subarea would also preclude oil spills from originating in the area, thereby providing a buffer between oil spill source and sensitive coastal marshes of the Florida Big Bend. Thus, deferring this small percentage of the Eastern Gulf would result in a very large reduction of the potential impact to these high value biological resources. Only oil spills from outside the seagrass area would still pose a threat to this area. Deferral of this subarea would remove nearly all the risk to offshore seagrass beds from oil and gas activities, including oil spills run for lease sales.

(b) Florida Middle Ground

This subarea consists of 23 blocks containing approximately 132,000 acres lying offshore Franklin County. It extends south from latitude 29°N to latitude 28°N and west from longitude 84°W to longitude 85°W. The Middle Ground extends up to 86 miles offshore Florida in water depths up to 40 meters. The Florida Middle Ground is probably the best known and most biologically developed of the live bottom areas with extensive inhabitation by hermatypic corals and related communities. This area is 87 nmi (160 km) west-northwest of Tampa and has been designated as a Habitat Area of Particular Concern (HAPC) by the Gulf of Mexico Fishery Management Council. The taking of any corals is prohibited except as authorized by permit.

The Florida Middle Ground represents the northernmost extent of coral reefs and their associated assemblages in the Eastern Gulf. The Middle Ground is like the Flower Garden Banks off Texas--typical Caribbean reefal communities although somewhat depauperate in terms of these types of coral communities.

Favorable environmental conditions associated with offshore distance and moderating currents allow occupation of the Middle Ground by numerous stenoecious fishes recruited from the Caribbean-West Indian region. Transparent waters, shallow reef crests, irregular bottom topography, well-defined currents, and carbonate sediments attract many insular reef fishes either rare or absent at other West Florida Shelf reefs. Environmental stability at the Middle Ground has undoubtedly enhanced development of its diverse fauna.

The dominant stony corals of the Middle Ground include Madracis decactis, Porites divaricata, Dichochocoenia stellaris, and Dichochocenia stokesii. Octocorals, a relatively minor component of other Gulf reefs, are prominent on the Middle Ground; dominant forms include Muricea elongata (orange Muricea), Muricea laxa (dekucate Muricea), Eunicea calyculata (warty Eunicea, and Plexaura flexuosa (sea rod)). Recreational activities are limited by the distance from shore. Despite the distance from the coast to the Florida Middle Ground, enthusiastic sport fishermen and recreational divers have been reported to frequent the area. The Middle Ground was nominated as a marine sanctuary. This area is frequented by commercial fishing boats since the primary fish species involved include the red snapper and grouper, which dominate the landings and value of landings of Gulf reef fish.

Deferral of the Florida Middle Ground will result in a very large reduction of the potential impact to the high value biological resources. The biological resources of the Middle Ground are considered very sensitive to potential impacts due to oil and gas operations. Deferral would remove the risks to the biological resources of the area from offshore operations on the 23 blocks.

b. Unavoidable Adverse Impacts

Refer to Section IV.B.4.j. for a discussion of unavoidable adverse impacts resulting from the proposed action.

c. Relationship Between the Short-term Use of Man's Environment and the Maintenance and Enhancement of Long-Term Productivity

Refer to Section IV.B.4.k. for a discussion of this topic.

d. Irreversible and Irretrievable Commitment to Resources

Refer to Section IV.B.4.1. for a discussion of this topic.

e. Impacts of a High Case Scenario

(1) Physical Environment

(a) Impacts on Water Quality

The estimated discharge of up to 0.27 billion bbls of formation waters, 1.3 million bbls of drilling muds, 0.15 million cu. yds of drill cuttings, 0.15 million bbls of sand from drilling operations, and an average of 5,500 gallons/day/platform of treated sanitary and domestic wastes may be expected as a result of this scenario. Pipeline-related activities would result in the disturbance of up to 2.16 million cu. yds. of sediment.

Offshore waters will be subject to impacts from discharges of drilling fluids, formation waters, and other effluents which add burdens of both toxic and nontoxic materials to the water column. However, the natural processes of dispersion, degradation, and sedimentation will result in immeasurably low concentrations of these materials within a few meters to a few kilometers of the discharge site, resulting in low impacts.

Discharge from onshore support facilities is estimated to be minimal with impacts to onshore water quality expected to be very low. These impacts may stem from the construction and operation of OCS onshore support facilities, particularly the estimated 2 new gas processing plants, 18-192 miles of onshore pipelines, and 5 new service bases projected.

CONCLUSION The overall impact to offshore water quality is estimated to be low; whereas, the impact to onshore water quality is estimated to be moderate.

(b) Impacts on Air Quality

Refer to the for the Western Gulf in Section IV.B.4.h.(3)(b) on air quality.

CONCLUSION The impact on air quality is expected to be low in Hillsborough, Pinellas, Hernando, Wakulla, Jefferson, Monroe, and Dade Counties; and very low in the remainder of the coastal area.

(2) Biological Environment

(a) Impacts on Plankton

The increased activity associated with the total case scenario will subject the Gulf waters to discharges of drilling fluids, formation waters, and other effluents which add burdens of toxic and nontoxic materials to the water column.

Refer to Section IV.B.6.h.(3)(a) for a discussion of these added materials. However, the natural processes of dispersion and dilution will result in immeasurably low concentrations of these materials within a few meters to a few kilometers of the discharge site. Only those plankton in the immediate vicinity of the discharge site would be affected.

CONCLUSION The expected level of impact on plankton is very low.

(b) Impacts on Benthos

The benthos of live bottom areas are expected to receive a very high level of impact from the proposed action. Any increase in activity within these areas resulting from the high case scenario would have a very high level of impact on these communities.

CONCLUSION: The expected level of impact is low; however, for benthic communities associated with live bottom areas, the impact would be very high.

(c) Impacts on Fish Resources

One large spill (1,000 bbls or greater) is assumed under the high case scenario for this area. Three hundred sixty (360) miles of new pipelines are also expected to result under this scenario. A large spill contacting open bays containing finfish and shellfish nurseries and/or spawning grounds could cause severe, medium-term effects on fish resources. Pipeline placement activities would have localized impacts on fish resources, including the destruction of benthic species, fishery habitats, and increased turbidity. Refer to Section IV.B.5.a.(4)(c) for an additional discussion of impacts on fish resources.

CONCLUSION The level of expected impact on fish resources is estimated to be moderate.

(d) Impacts on Marine Mammals

One oil spill of 1,000 bbls or greater and several smaller spills are assumed for this analysis. As indicated previously, only a small portion of the marine mammals would be exposed to potential OCS-related oil spills. It is estimated that the level of impact on marine mammals from these oil spills would be low.

Vessel traffic is estimated to increase about 2% under the high case scenario, slightly increasing the potential for collisions with marine mammals. It is estimated that the level of impact to marine mammals from this increased vessel traffic would be very low.

About 287 wells will be drilled, and additional seismic activities will be required over the assumed 20-30 year period of the proposed action. The effect of this increased activity and noise disturbance to marine mammals is unknown. However, as this disturbance is usually short-term and fairly localized, the level of impact on marine mammals is estimated to be low.

CONCLUSION The level of impact to marine mammals as a result of the high case scenario is estimated to be low.

(e) Impacts on Coastal and Marine Birds

One oil spill of 1,000 bbls or greater and several smaller spills is assumed for this analysis. It is estimated that the level of impact to coastal and marine birds from these oil spills would be low.

OCS-related air and vessel traffic is estimated to increase about 2%. Up to four oil/gas pipeline landfalls, up to five new supply bases, and six other onshore facilities are estimated under the high case scenario. This potential OCS-related activity is estimated to result in a low level of impact to birds.

CONCLUSION The level of impact to coastal and marine birds as a result of the high case scenario is estimated to be low.

(f) Impacts on Endangered and Threatened Species

As indicated previously, only a small portion of the endangered and threatened species habitat might be contacted by one large oil spill and several smaller spills estimated for the high case scenario. It is estimated that the level of impact to endangered and threatened species from oil spills would be low.

Air and vessel traffic is estimated to increase about 2% under the high case scenario, slightly increasing the potential for collisions with endangered and threatened species. It is estimated that the level of impact on endangered and threatened species from this increased air and vessel traffic would be very low.

About four oil/gas pipeline landfalls, five supply bases, six other onshore facilities, one navigation channel, and an undetermined amount of maintenance dredging of existing canals are estimated under the high case scenario. It is estimated that this activity could result in a low level of impact to endangered and threatened species.

CONCLUSION The level of impact to endangered and threatened species as a result of the high case scenario is estimated to be low.

(g) Impacts on Seagrasses

One oil spill of 1,000 bbls or greater and several smaller spills are assumed for this analysis. As indicated previously, only a moderate portion of the seagrasses could be exposed to potential OCS-related oil spills. It is estimated that the level of impact to seagrasses from these oil spills would be low.

Up to four oil/gas pipeline landfalls, one navigation channel, and an undetermined amount of maintenance dredging of existing canals are estimated.
It is estimated that up to 144 acres of seagrasses could be damaged or destroyed as a result of these activities. This represents a loss of less than 0.01% of the total seagrasses and an estimated very low level of impact.

CONCLUSION The level of impact to seagrasses as a result of the high case scenario is estimated to be low.

Impacts on Wetlands

One oil spill of 1,000 bbls or greater and several smaller spills are assumed to occur as a result of the high case scenario. About one-eighth of the wetlands could be exposed to potential oil spills, and a portion of these wetlands could be damaged or destroyed. It is estimated that the level of impact to wetlands from oil spills would be low.

Up to four oil/gas pipelines, up to five supply bases, six other onshore facilities, one navigation channel, and an undetermined amount of maintenance dredging of existing drainage canals and navigation channels are estimated. It is estimated that up to 725 acres of wetlands could be damaged or destroyed if these OCS-related facilities are located in wetland areas. This represents a loss of less than 0.01% of the total wetlands and could result in an estimated low level of impact.

CONCLUSION The level of impact to wetlands as a result of the high case scenario is estimated to be low.

(h) Impacts on Areas of Special Concern

The areas of special concern in the Eastern Gulf are the live bottoms including the seagrass beds and the Florida Middle Grounds. Up to 11 platforms with 181 development and production wells, and 108 exploratory wells are expected from the high case. Some of this activity could take place on or near an area of special concern. Actions associated with this activity; anchoring, dumping of drill muds and cuttings, and platform construction could adversely affect the areas by disrupting the substrate upon which the organisms are located, or could smother sessile organisms. Impacts could be intense at the sites of operations, causing a complete obstruction of the area in the vicinity of operations, or a change of species if recovery takes place after operations cease.

These areas are expected to receive a very high level of impact from the proposed action. Therefore, any increase in activity as a result of the high case scenario would have a very high level of impact.

CONCLUSION The expected level of impact is very high. See section IV.B.6.a.(b) regarding the deferral of the Florida Middle Grounds and seagrass beds subareas from the 5-year program.

(i) Impacts on Marine Sanctuaries

There are no marine sanctuaries in the Eastern Gulf.

(3) Socioeconomic Environment

(a) Impacts on Local Employment and Demographic Conditions

This scenario is expected to generate a greater level of employment in the Eastern and Central Gulf coastal regions than the development scenario associated with the proposed action. The new resident activity will also be higher; however, the impact in all affected coastal subareas is expected to be very low as under the proposed action. New resident employment, payroll, and population is expected to peak in the year 1995 over a 6-year period at about 1,200 jobs, $25 million, and 2,900 people, respectively. This peak new resident activity represents less than 1% of the total employment, payroll, and population in the affected coastal counties.

The employment generated by the proposal on the affected would represent a maintenance of existing oil and gas related employment rather than new resident employment, and the impact on those counties would, therefore, be negligible.

CONCLUSION The expected level of impact is low for all the affected coastal counties in the Eastern Gulf.

(b) Impacts on Coastal Land Uses

An increase in oil and gas activity under the high case would result in the addition of up to five new service bases and two new gas processing plants. There new facilities may require the conversion of existing developed land or the improvement of new land. State and local land use policies indicate that potential incapatabilities or conflicts may be avoided or effectively mitigated through a sufficiently flexible regulatory frmework, capable of reconciliation of most site-specific problems which may emerge after the sale.

CONCLUSION The expected level of impact on State and local land use will be low.

(c) Impacts on Water Supply

The addition of up to five new service bases and two new gas processing plants will impact area water supplies. As a result of this, the impacts to the regional water supply are expected to be high, with several areas being substantially affected and where requiring modification of existing facilities.

CONCLUSION The impact to area water supply is estimated to be high.

(d) Impacts on Commercial Fisheries

An estimated 11 platforms are expected under the high case scenario, eliminating less than 0.1% (33-55 acres) of the trawling area. One large spill (1,000 bbls or greater) is assumed for this area under the high case scenario. A large spill contacting open bays containing finfish and shellfish nurseries and/or spawning grounds could cause severe medium-term effects on fisheries. Refer to Section IV.B.5.a.(5)(d) for an additional discussion of impacts on commercial fisheries.

CONCLUSION The level of expected impact on the commercial fishing industry is estimated to be moderate.

(e) Impacts on Recreation and Tourism

Continued OCS leasing under a high case scenario will result in the additional installation of an estimated 11 new offshore platforms through the year 2000. These platforms and the prerequisite exploratory drilling rigs will be at least 10 miles from shore and coastal shorefront recreational and tourist centers. Those platforms and drilling rigs operating within 10-15 miles of shore will be visible from shore during clear weather conditions and will impose a limited amount of distraction from the background viewshed of coastal recreation shorefronts. Those production platforms are installed within 25 miles of major population centers and resort communities and are likely to become popular fishing locations.

Assuming the high case scenario results in multiple oil and gas field discoveries throughout the planning area, additional pipeline landfalls can be expected to accommodate product transmission to processing and refinement centers. Additionally, the potential for oil spills occurring and contacting shorefront recreational resources is likely to increase. The amount of trash and debris washing ashore from offshore operations will also increase.

CONCLUSION The overall effect on recreation and tourism is expected to remain low.

(f) Impacts on Archaeological Resources

(Historic) Under this scenario, it is estimated that up to 1,500 acres could be disturbed by offshore development in archaeological Zone 1. This acreage is only 0.2% of the total unleased acreage which falls within archaeological Zone 1.

Therefore, although there is the potential for a loss of significant historic archaeological data should a direct interaction occur between an impact producing factor and an historic shipwreck, due to the low amount of acreage which would be disturbed relative to the total amount of unleased acreage in the Eastern Gulf, the potential for such an interaction occurring is assessed as being low. Under this scenario, there could be a maximum of 3,000 acres disturbed by onshore development. Due to the relatively low amount of acreage projected for disturbance, the visibility of most onshore historic sites and State and Federal cultural resource laws which require consideration of historic properties if any State of Federal funding or permits are required for construction, the expected impact to coastal historic sites as a result of the projected onshore development associated with this scenario is low.

Up to four oil spills of 1,000 bbls or greater and several smaller oil spill contacts are assumed for this analysis. Should one or more of these spill contacts be with a coastal historic site such as forts and lighthouses, the major impact would be visual due to oil contamination of the site and its environment. This impact would probably be temporary and reversible with no actual loss of information.

CONCLUSION The expected level of impact on historic archoeological resources is low.

(Prehistoric) Under this scenario, it is estimated that up to 18,000 acres could be disturbed by offshore development in archaeological Zones 1 and 2. This acreage is only 0.2% of the total unleased acreage which falls within archaeological Zones 1 and 2.

Therefore, although there is the potential for a loss of significant prehistoric archaeological data should a direct interaction occur between an impact producing factor and an inundated prehistoric site, the potential for such an interaction occurring is assessed as being low.

Under this scenario, there could be a maximum of 3,000 acres disturbed by onshore development. Due to the relatively low amount of acreage projected for disturbance and State and Federal cultural resource laws which require consideration of cultural resources if any State or Federal funding or permits are required for construction, the expected impact to coastal prehistoric sites as a result of the projected onshore development associated with this scenario is very low.

Up to four oil spills of 1,000 bbls or greater and several smaller oil spill contacts are assumed for this analysis. Should one or more of these spill contacts be with a coastal prehistoric site, the potential for dating the site using Carbon-14 would be destroyed. However, if diagnostic artifacts are present in the site, loss of C-14 dating potential may not constitute a loss of unique information.

CONCLUSION The level of impact to prehistoric cultural resources is expected to be low.

(g) Impacts on Marine Transportation and Ports

Vessel traffic is expected to increase by 7%, or 4,300 trips, in the peak year of activity over the current annual level of over 61,000 trips associated with oil and gas and all other activities. Only 11 structures are expected to be emplaced as a result of the proposed action. It is unlikely that these structures will create a significant hazard to navigation if regulations pertaining to adequate markings are adhered to and if locations are made known to mariners.

CONCLUSION Increased vessel traffic expected in the peak year of activity and structures resulting from the proposed action indicate that impacts on affected marine transportation and ports will be very low.

(h) Impacts on Military Uses

At present, there are no platforms within the warning areas and water test areas of the Eastern Gulf.

However, by the year 2010 the number of platforms is expected to be over 30. Because of the location of the potential resources most likely to be developed in the Eastern Gulf, most of these platforms will be located in areas of moderate interest. Also, due to the geology and likelihood that natural gas will be the predominant find within the area, the platforms will be dispersed rather than concentrated. For military activities the number of platforms and exploration rigs, and the number of service vessel and helicopter trips could pose serious operational problems.

CONCLUSION The impact on military activities will be high within all warning areas and water test areas.

f. Alternative II - Subarea Deferrals

This alternative evaluates the deferral from leasing in the 5-year program of 13 additional subareas in addition to those 14 subareas deferred from leasing in the 5-year program proposal (Alternative I). Two of these additional subareas are in the Eastern Gulf of Mexico planning area.

(1) Eastern Gulf of Mexico, Miami Map Area

This subarea ranges approximately from south of latitude 26°N to east of longitude 82°W in the Miami protraction diagram area. It extends southwestward from approximately 23 miles off the coast of Florida to approximately 49 miles offshore in water depths ranging between 10-20 meters. South of this subarea lies the ecosystem associated with Florida Keys. Live bottom communities consisting of algae, ascidians, hard corals, gorgonians, hydrozoans, and sponges, can be expected, scattered throughout this area. The subarea is offshore of the Everglades National Park, extensive stands of mangroves, and freshwater marsh. This entire coastal area is a sensitive and valuable national resource. The subarea lies in proximity to vast amounts of seagrass beds, mangroves, and marshes. The coastal and offshore area supports a number of coastal/marine birds and endangered species including the manatee, key deer, and numerous sea turtle nesting areas.

The deferral of this subarea would protect live bottom communities from impacts due to oil and gas activities. Oil spills due to MMS permitted activities would not occur in this area. Although the potential for oil spills is low, the potential impact is significant. Deferral of this subarea would eliminate the potential for oil and gas leasing activity caused oil spills from occurring in the subarea, and would mitigate the impacts from spills which could occur outside the area by allowing increased time before contact for cleanup, dispersion, and weathering of the oil. Significant impacts to sensitive and valuable coastal habitats, coastal/marine birds, and endangered species may be avoided by deletion of this subareas.

(2) Florida West Coast Nearshore Block Deferral

This subarea consists of approximately 8.46 million acres lying offshore Bay to Monroe Counties, extending about 30 miles from shore along the coast from Naples to Apalachicola. The area is in water depths up to about 60 meters.

The offshore area is scattered with live bottom communities comprised of sponges, octocorals, gorgonians, and a few hard corals. The actual extent and location of these live bottoms is unknown. The coastal area of Florida encompasses a wide variety of habitats, including seagrass beds, salt marshes, fresh marshes, mangroves, barrier beaches, estuaries, and coral reefs. The estuaries and marshes are very important in the production of commercially and recreationally important fish and wildlife species. The Florida beaches are important storm protection and erosion control areas. The Florida tourism industry is based on the presence of these beaches. The seagrass beds support numerous commercially and recreationally important fishery and wildlife species.

Deferral of this subarea would preclude drilling operations and so eliminate the threat of damage from oil spills, drilling discharges, anchoring, or plantform emplacement in the areas removed.

In addition, the deferral of this subarea would allow additional time for oil spill cleanup, containment or dispersion, and weathering before contact with the shore and sensitive coastal habitats.

g. Alternative III - Add a Sale in the Straits of Florida

This alternative would add a lease sale (1991), in that portion of the Florida straits planning area south of the Florida keys, to the 5-year leasing schedule as prescribed under the proposed action. It is anticipated that the addition of this sale, will have no affect on the resource and infrastructure estimates projected for the Eastern Gulf under the proposed action. The expected levels of impact, on the various topics of concern, will therefore be the same as for the proposed action.

h. Alternative IV - Biennial Leasing

This alternative proposes triennial pace of leasing in those federal OCS areas which have triennial sales under the proposed action. The Eastern Gulf is included in this alternative and therefore, adoption of the alternative would add one lease sale in this planning area.

Minor increases in both resource and infrastructure estimates, over projections for the proposed action, are anticipated. An additional one platform, 9 exploration/delineation wells, 15 development/production wells are projected over those estimates for the proposed action. These minor increases will result in slight elevations of numbers and quantities of effluent discharges and emissions in connection with these activities.

Despite these minor increases, it is anticipated that the additional sale will not change the levels of impact, on the various topics of concern, as described for the proposal.

i. Alternative V - The Acceleration Provision

The adaptation of Alternative V would allow the acceleration of sales in the Eastern Gulf of Mexico from a triennial basis to a biennial basis (without adding additional sales to the schedule). The resource and infrastructure estimates would remain the same as for the proposed action;

however, the development timetable would be accelerated. It is expected that the levels of impact on all resources/activities will be similar to those estimated for the proposed action.

j. Alternative VI - Defer Leasing in Six Planning Areas

This alternative evaluates the deferral from leasing, during the proposed 5-year program, six federal OCS planning areas. The Eastern Gulf is not included as one of these areas to be deferred; therefore, it is anticipated that the adoption of this alternative will have no affect on the resource and infrastructure estimates projected under the proposed action. The expected levels of impact, on the various topics of concern, will therefore be the same as for the proposed action.

Adoption of Alternative VI will not have a significant effect on the Eastern Gulf of Mexico planning area and the expected level of impact will be the same as for the proposed action.

k. Alternative VII - No Action

All positive and negative impacts associated with the proposed action (as discussed in Section IV.B.6.a.) would be cancelled.

The opportunity would be foregone or postponed for development of the 0.06 billion bbls of oil and 0.3 tcf of gas in the Eastern Gulf. Development of alternative energy supplies as replacement resources for lost domestic production is discussed in Section VIII.C.

If this alternative is adopted, all environmental impacts that could have occurred under the proposed action will be avoided. Adverse socioeconomic impacts could include a loss of employment opportunities, payroll revenues, and tax revenues. See section II.A.7 for a summary of environmental impacts of alternative energy sources and Appendix C. for a further discussion of alternative energy sources.

7. Washington/Oregon

a. Alternative I

The proposal includes holding one sale in the Washington and Oregon planning area. It is estimated that the sales will produce about 58 million barrels of oil and 1,043 billion cubic feet of gas over a 35 year period. Approximately 10 exploration wells will be drilled, these resources will be produced from 29 production wells from 1 platform. In addition to the oil and gas, about 43.5 m bbls of formation water will be produced. Approximately 175,000 bbls of muds and cuttings could be discharged into the sea over the life of the proposal. It is anticipated that 1 new support base will be required.

(1) Interrelationship of Proposal with Other Projects and Proposals

(a) Oil and Gas Sanctuaries

There are no State Oil and Gas Sanctuaries in Washington and Oregon.

(b) National Parks and Sanctuaries

There are no National Parks and Sanctuaries within Washington and Oregon Planning Area.

(c) Coastal Zone Management

(i) Washington

The Washington CZMP is based on the Shoreline Management Act of 1971 (SMA), as amended. The SMA established broad guidelines for management on all of the State's marine waters, lakes over 20 acres and streams with a mean annual flow of 20 cubic feet per second or more, and their associated wetlands including all upland areas 200 feet from the ordinary high water mark. It should be noted that the SMA is a statewide statute and its jurisdiction extends beyond the areas covered directly under the CZMP. Federal approval for the CZMP was received in 1976.

The Washington CZMP is a networked management program involving several State Agencies, 15 counties and 36 cities. The lead Agency for program implementation is the State's Department of Ecology (DOE). For the CZMP, the State has developed a two-tier approach based on the authorities granted under the SMA. The first-tier applies to all of the State's saltwater shorelines and their associated wetlands, including at a minimum all upland areas within 200 feet of the ordinary high water mark. The second tier applies to all lands outside of the first-tier within the 15 coastal counties which front on saltwater. All 51 local governments are authorized by the SMA to issue or deny permits for activities within the first-tier management areas. In the second-tier management areas, permitting of regulated activities are primarily by State Agencies.

State and local permitting actions are required by the SMA to conform with applicable Shoreline Master Programs which are prepared by local governments and approved by the State through the DOE in accordance with State guidelines. Upon recommendations by a local jurisdiction, the DOE also acts on conditional use and variance permits. All State and local permitting decisions may be appealed to the Environmental Hearing Board (EHB). In particular, the DOE is authorized by the SMA to undertake appeals against local permits deemed inconsistent with State guidelines.

In addition to the SMA, several other State laws are also incorporated by reference into the CZMP network. Planning and regulatory activities under these laws are administered separately from the DOE by other State Agencies such as the Energy Facility Site Evaluation Council and the Department of Natural Resources. These "networked" programs are not statutorily related to the local shoreline management plans or programs that constitute the backbone of the Washington CZMP.

(ii) Oregon

The Oregon Coastal Zone Management Program is a subset of the State's comprehensive land use program authorized under the Oregon Land Use Act of 1973 (commonly referred to as ORS 197), as amended. The Act created the Land Conservation and Development Commission (LCDC) and its administrative arm, the Department of Land Conservation and Development (DLCD). As required under ORS 197, the DLCD completed development of a special set of State land use goals and guidelines on coastal resources (including estuarine resources, coastal shorelands, beaches and dunes, and ocean resources) in December 1976. Following the adoption of these goals and guidelines by the LCDC, the Oregon CZMP received Federal approval in June 1977.

Oregon's coastal zone extended inland to the crest of the coastal mountain range, excluding the Umpqua, Rogue, and Columbia River basins that penetrate the coastal mountains but originate in the Cascades or interior lands.

Cities and counties in the coastal zone are required by ORS 197 to develop and implement a comprehensive land and water use plan and zoning and subdivision ordinances in accordance with adopted State coastal resources goals and guidelines. State agencies with planning and regulatory activities applicable to coastal resources are also required to conduct their activities in a way consistent with coastal goals and guidelines. The DLCD, as the designated lead Agency for the CZMP, is responsible for review and coordination of State and local compliance with the requirements of State coastal resource goals and guidelines. It is also the Agency directly responsible for determining the consistency of Federal activities with the CZMP.

(d) Ocean Dumping

A variety of materials have been dumped off Washington and Oregon (see Table IV.B.7.a.(1)(d)-1), dredge spoils, low level radioactive wastes, obsolete munitions, industrial and municipal wastes.

TABLE IV.B.7.a.(1)(d)-1

OREGON AND WASHINGTON DESIGNATED DUMP SITES

Location		Depth	Content or Designated Waste
4851'N 12650'W	Off Cape Flattery	535 M	Explosives and Toxic Chemical Ammunition
4820'N 12453'W	Straits of Juan De Fuca	240 M	Industrial Waste
4816'N 12700'W	Off Cape Flattery	1,430 Fath	Explosives and Toxic Chemical Ammunition Chase XVI, XVII, XVIII, XIX, XX
4810'N 12600'W	Off Cape Flattery	643 Fath	Industrial Waste
4657'N 12407'W	Gray's Harbor Entrance	10 M	Dredge Spoil
4642'N 12410'W	Willapa Bay	30 M	Dredge Spoil
4614'N 12410'W	Columbia River	42 M	Dredge Spoil
4612'N 12409'W	Columbia River	44 M	Dredge Spoil
4612'N 12407'W	Columbia River	46 M	Dredge Spoil
4611'N 12409'W	Columbia River	42 M	Dredge Spoil
4534'N 12359'W	Tillamook	24 M	Dredge Spoil
4448'N 12405'W	Depoe Bay	25 M	Dredge Spoil
4436'N 12407'W	Yaquina River	30 M	Dredge Spoil
4401'N 12409'W	Suislaw River	20 M	Dredge Spoil
4340'N 12414'W	Umpqua River	30 M	Dredge Spoil
4321'N 12422'W	Coos Bay	26 M	Dredge Spoil
4307'N 12427'W	Coquille River	12 M	Dredge Spoil
4224'N 12429'W	Rogue River	22 M	Dredge Spoil
4224'N 12427'W	Rogue River	22 M	Dredge Spoil
4202'N 12416'W	Chetco Cove	22 M	Dredge Spoil
5056'N 13603'W	350 M NW of Cape Flattery	3,294 M	Low Level Radioactive Waste

Table IV.B.7.a.(1)(d)-1 (continued)

Location		Depth	Content of Designated Waste
5225'N 14012'W	350 M NW of Cape Flattery	3,294 M	Low Level Radioactive Waste
5130'N 13631'W			Low Level Radioactive Waste
5205'N 14000'W			
4700'N 13854'W			Low Level Radioactive Waste
4212'N 12931'W	230 M W of OR/CA Border	3,294 M	Low Level Radioactive Waste
4352'N 12744'W	190 M W of OR/CA Border	2,928 M	Low Level Radioactive Waste
4204'N 12501'W	35 M W of OR/CA Border	4,099 M	Low Level Radioactive Waste

Source: MMS Files, 1985.

Ocean dumping of acceptable waste material is authorized under Title I of the Marine Protection, Research and Sanctuaries Act of 1972, as amended (33 U.S.C. 1401), and the Federal Water Pollution Control Act, as amended (33 U.S.C. 1251). Regulations concerning ocean dumping (40 CFR 220), were revised in 1977. Regulations (40 CFR Subchapter H) concern the procedures and criteria for the issuance of permits and the designation and management of ocean disposal areas.

The Environmental Protection Agency administers the desgination and management of ocean disposal areas and permits for dumping of all acceptable wastes except dredged materials. Permits for the dumping of dredged materials are administered by the Army Corps of Engineers. A variety of materials have been dumped offshore, including dredge spoils, low level radioactive waste, obsolete munitions, industrial waste and municipal waste.

Dredge spoils are the materials dredged from the ocean or harbor bottom in the process of deepening or maintaining depth of ship channels and harbors. These materials are either dumped at designated dredge spoil dump sites, or are used as replacement materials for local beaches, or used in land reclamation projects.

Low level radioactive waste has not been dumped at sea by the U.S. since 1970; prior to that tools, gloves, transport containers, and other articles which had been contaminated were disposed of at sea. The contaminated material was usually placed in 200-liter (55-gallon) oil drums and completely surrounded with concrete (NAS, 1971). These drums were then dumped into the ocean at the designated sites. The integrity of these containers is not always assured as they have been known to rupture due to the pressure. Of the 59,000 containers dumped at the Farallon Islands between 1966 and 1969, it was estimated that in 1977 as many as 25 percent of the containers may be leaking (Lipshutz, 1980).

Low level waste contains on the average less than one curie of activities per cubic foot of material, which allows for "hot spots" where the contamination may be many times the average level (Lipshutz, 1980). In 1970 disposal by shallow land burial became the accepted means of disposal of low level radio-active waste (Brown, 1971; EPA, 1980).

Obsolete munitions dumping was one of the methods used by the Department of Defense to dispose of explosives and toxic chemical munitions, which had either passed their useful life, or had become outdated or required disposal for other reasons. Numerous methods were used for this disposal among which were containerized in drums, and by loading onto obsolete liberty ships, which were scuttle at sea.

Industrial waste is comprised of waste products for various industrial processes. Both bulk and containerized disposal has occurred in the past. Bulk disposal is usually done from tank barges while underway this will have no impact with OCS activity. Containerized disposal is usually in 55-gallon drums and this is used for toxic industrial liquids and sludges. These barrels are either weighted for sinking or are ruptured at the sea surface.

(e) Memorandum of Agreement Between the Department of Defense and the Department of the Interior on Mutual Concerns on the Outer Continental Shelf

On July 20, 1983, the Secretary of Defense and the Secretary of the Interior agreed to establish procedures for joint use of the Outer Continental Shelf. For a more detailed discussion on the Memorandum of Agreement see Section IV.B.10.a.(1)(e). Also see Section III.C.10.c.(7) for a discussion of military use areas.

(2) Projects Considered in Cumulative Impact Assessment

(a) Oil and Gas Activities

The second federal OCS oil and gas lease sale on the Pacific Coast was held on October 1, 1964 off the states of Oregon and Washington. A total of 196 tracts were offered for lease: 149 tracts off Oregon and 47 tracts off Washington. Following the lease sale 12 wells were drilled: four wells off Washington and eight wells off Oregon. All leases were relinquished between November 21, 1966 and November 30, 1969. For a complete discussion of the history of the POCS Lease Sales see the Pacific Summary Report April 1985 (MMS, 1985).

(b) Oil and Gas Infrastructure

The majority of existing oil and gas infrastructure in Oregon and Washington are support for oil and gas development from the North Slope of Alaska.

(i) Refineries

At the refineries crude oil undergoes several processing stages, including separation, conversion and treatment. Refineries range in size from small plants capable of processing only 190 barrels of crude per day to complex facilities which process more than 500,000 barrels per day. For a list of the refineries and their capacities see Table IV.B.7.a.(2)(b)-1

(ii) Platform Fabrication Yards

Large construction firms have investigated the potential for west coast fabrication yards to produce platforms for Alaska and possibly California development.

In the Port of Tacoma, Concrete Technology is proposing the construction of a yard to produce platforms, primarily for Alaska. Bechtel Petroleum is planning a Vancouver, Washington offshore fabrication-construction yard.

In Oregon, three sites on Coos Bay have obtained all the permits required for construction of a platform fabrication yard, and some module construction for the North Slope of Alaska is currently under way. At

TABLE IV.B.7.a.(2)(b)-1

REFINERIES PROCESSING OFFSHORE OIL WASHINGTON/OREGON PLANNING AREA

Refinery Location	Operating Crude Oil Capacity (bpcd)
Atlantic Richfield Co. - Ferndale (Cherry Point)	146,000
Chevron U.S.A. Inc. - Richmond Beach	5,500
Mobil Oil Corp. - Ferndale	71,500
Shell Oil Co. - Anacortes	72,000
Sound Refining Inc. - Tacoma	11,900
Texaco Inc. - Anacortes	78,000
U.S. Oil & Refining Co. - Tacoma	25,000

Astoria, Oregon Astoria Oil Services is currently building modules for ARCO's Lesburne field develop-ment in Alaska. At the Port of Portland, modules are also being constructed for the Lesburne field (MMS, 1985).

(iii) Marine Terminals/Tank Facilities

There are four marine terminals in Washington State, two at Cherry Point, one operated by ARCO the other by Mobil. The two other marine terminals are located at March Point near Anacortes. These marine terminals handle crude oil from the North Slope of Alaska, and should be sufficient to handle all production from this proposal.

Located in Oregon at Yaquina Bay near the Port of Newport is an LNG facility. There are also two small tank facilities at Astoria and Coos Bay. The tank facilities only service the local areas.

(c) Proposed Polymetallic Sulfide Minerals Lease Offering

The Department of the Interior continues to investigate the potential for metallic sulfide deposits (principally copper, zinc, and lead) along the Gorda Ridge offshore Oregon and California. The Gorda Ridge is believed to be a source of metallic sulfides similar to the sites found along the spreading center in the eastern Pacific. Recently, the USGS dredged large nuggets of sulfide minerals from the ocean floor along the Gorda Ridge. The location of the dredge sulfide minerals was about 170 miles off the coast of northern California and in 11,000 feet of water.

The Gorda Ridge Task Force MMS, USGS, NOAA and Oregon State University will continue to investigate for sulfide desposits to further delineate the extent and quality of the deposits. If the resource assessment of identified metallic sulfide deposits is thought to have economic potential the Gorda Ridge Task Force will further define what environmental studies are warranted and will provide recommendations for the Environmental Impact Statement for a proposed lease sale. Currently the previously proposed Lease Sale for the Gorda Ridge is on hold.

(3) Physical Environment

(a) Impact on Water Quality

Waters off the coast of Washington and Oregon are relatively free of pollution. Water quality in the region is influenced primarily by two natural phenomena which include: 1) upwelling during the summer months that brings deep water to the surface, thereby lowering dissolved oxygen and increasing nutrients and carbon dioxide (CO2) concentrations in coastal waters; and 2) run-off from a number of rivers, the most significant being the Columbia River. The dilution effect of the Columbia River plume extends offshore of northern California during the summer and extends as far north as the Strait of Juan de Fuca during the winter. The overwhelming effect of the Columbia River plume on various water quality parameters is exemplified by studies which have tracked its salinity, alkalinity, productivity, turbidity and radioactivity far into the sea. From 1944-1971, plutonium producing reactors at Hanford, Washington introduced radioactive waste into the Columbia River, which was subsequently traced in the water, sediments and biota (Oceanographic Institute of Washington, 1977). The mean annual flow of the Columbia River is 7,200 m3/sec and ranges annually between 3,000 and 20,000 m3/sec. About 75 percent of the total discharge of rivers into the ocean from Oregon and Washington comes from the Columbia River. The Columbia River carries some 6 million tons of suspended solids into the ocean each year (Proctor et al., 1980).

The fact that the Pacific Northwest Coastal Region is not densely populated is the main reason that most of the region's estuaries are essentially unpolluted. Exceptions occur in the more populated and industrialized estuaries and those associated with shipping activities (Grays Harbor, Yaquina Bay, Coos Bay, Humboldt Bay and Columbia River).

Localized degradation in water quality that is attributable to anthropogenic (man-made) causes include logging activities, pulp mill wastes, domestic and industrial discharges, and agricultural runoff. Sea disposal of dredge material also occurs in the region. In the Washington-Oregon coastal zone there are 516 wastewater discharges into the Pacific Ocean, Puget Sound, or tributaries leading directly to them. Of these, 195 discharges are from municipal sewage treatment facilities, and 318 are from industrial discharges. The average flow of waste in the planning area is 1.1 X (10)'(7) liters/day per discharge and contain an average of 2,900 kilograms of biochemical oxygen demand (BOD). Only 53 discharges (about 10 percent) discharge more than 1.9 X (10)'(7) liters/day, and only 19 discharge more than 1.4 X (10)'(4) kilograms of BOD/day.

Little information is available on background concentrations of pollutants such as trace metals and petroleum hydrocarbons in water, sediments and biota on the open coast of Washington and Oregon. Natural oil and gas seeps reportedly occur off the Olympic Peninsula of Washington, but no significant effects from the seeps have been described (Rau, 1973, as cited by Oceanographic Institute of Washington, 1977). Average hydrocarbon concentrations for waters of the North Pacific are about 0.2 ppb; such concentrations are apparently related to the general level of vessel traffic. Inland waters, especially within the Puget Sound region, have relatively more data on water quality available (Oceanographic Institute of Washington, 1977). Brown, et al. (1979) concluded that 23 sites located along shipping lanes in Puget Sound were relatively free of petroleum contamination.

Throughout oil and gas development and operation, a wide variety of liquid and solid wastes will be produced on the drilling platform, some of which are discharged to the ocean. All discharges are regulated by the Environmental Protection Agency through issuance of National Pollutant Discharge Elimination System (NPDES) permits. Liquid and solid wastes that are permitted for discharge may include up to 175,000 bbls of drilling muds and cuttings; up to 43.5 m bbls of produced waters; well completion and treatment fluids; deck drainage; sanitary and domestic wastes; cooling water from machinery; bilge and ballast water from support vessels. In addition, submerged parts of the platform may be protected against biofouling and corrosion with antifouling paints and sacrificial electrodes. These paints and electrodes may release small amounts of metals including Al, Cu, Hg, In, Sn and Zn. Pipe lubricants and pipe joining compounds (dope) may contribute small amounts of trace metal and hydrocarbons to the discharges. Oily wastes that occur from produced waters, cooling waters, deck drainage or other sources are treated in oil/water separators before discharge. Domestic and sanitary wastes are treated in an activated sludge system before discharge.

The fate and effects of drilling muds and cuttings discharged into the sea have been discussed in detail in the FEIS for OCS Lease Sale No. 53 (BLM, 1980) and Sale 68 (BLM, 1981); additional references include Courtesy Associates (1980), Petrazullo (1981), Dames and Moore (1980), National Research Council (1983), Boesch and Rabalais (1985). Based on the dispersion/dilution model developed by Brandsma, et al. (1980) (as cited by Neff, 1985), the discharge of drilling muds and cuttings from a submerged pipe can be viewed as going through three distinct phases: convective descent of the jet of material, dynamic collapse and passive diffusion. In the first phase low density particles are entrained and bend toward the direction of current flow. Larger or denser solids descend until they hit the bottom, while light particles and solubles undergo dynamic collapse when the plume encounters a level of neutral density. Dilution by passive diffusion and convective mixing of the lighter plume (containing less than 10 percent of the solids) continues as the remaining 90 percent of the solids settles to the bottom. Dilution of drilling fluids to low concentrations is very rapid, usually within 1,000-2,000 m downcurrent of the discharge pipe and within 2-3 hours of discharge (Ecomar, 1978, 1983; Ayers, et al., 1980a, b; Ray and Meek, 1980; Houghton, 1980; Northern Technical Services, 1983). Typically, suspended solids concentrations are reduced to 1,000 ppm within two minutes of discharge and below 10 ppm within one hour (Neff, 1985). Dilutions of 1,000-fold for more are generally encountered within 1 to 3 meters of the discharge. Localized turbidity associated with the muds and cuttings plume will reduce light penetration and, therefore, photo-synthesis by phytoplankton.

The distance that the solids from drilling muds become dispersed and their concentration in bottom sediments depends on the quantities discharged, hydrographic conditions during and after the discharge, and the height of the discharge pipe above the bottom. In some cases, piles of drilling cuttings may be several meters high and 100-200 meters in diameter around the base of the platform. In non-depositional environments with relatively strong currents, the solids may be dispersed or resuspended from their depositional sites and eventually settle in low energy areas (National Research Council, 1983).

Most of the major ingredients of water-based drilling fluids have low toxicity to marine organisms. Lignosulfonates containing chrome and ferrochrome and caustic (sodium hydroxide) are slightly toxic. Neff's (1985) review of litera-ture on the acute toxicity of more than 70 water based drilling muds in over 400 bioassays with at least 62 species of marine organisms showed that nearly 90 percent of the LC50 values were above 10,000 ppm. Only two LC50 values were below 100 ppm. Drilling muds containing hexavalent chromium, diesel fuel or surfactant were the most toxic.

Chronic or sublethal effects of drilling muds have been examined on at least 40 species of marine animals (Neff, 1975). Some species such as reef corals, lobster larvae, and scallop embryos and larvae showed sublethal responses to drilling muds at concentrations that were two orders of magnitude below the concentrations that were acutely lethal. Neff (1985) concluded that organisms in the water column (i.e., plankton) will never be exposed to drilling muds long enough to show even sublethal effects because the rates of dilution of drilling muds are so rapid in the field. However, recruitment of larvae to sediments exposed to high concentrations of drilling muds was reduced in laboratory (microcosm) experiments, suggesting that adverse impacts to benthic organisms in the immediate vicinity of the platform may occur because of the slight toxicity of deposited drilling muds. Bioaccumulation of barium and chromium and a slight accumulation of copper, cadmium and leda from drilling muds have been reported. Deposition of drilling mud solids may cause changes in sediment texture or simple burial of organisms beneath the platform and result in very localized high impacts.

Produced water includes water and suspended particulate matter that has been in contact with fossil fuel bearing formations and may contain elevated concentra-tions of hydrocarbons, dissolved inorganic ions and metals. After discharge to the sea, produced water is rapidly mixed and diluted. Although produced waters have low dissolved oxygen and pH, and high salinity relative to the receiving waters, these parameters do not pose a hazard to organisms in the water column because of rapid mixing. Low molecular weight aromatic hydro-carbons and some metals in produced waters are potentially toxic when present in sufficient concentrations, but more than 88 percent of the 54 bioassays per-formed to date (Neff, 1985) suggest that produced waters are virtually nontoxic. Laboratory studies on potential sublethal or chronic effects of produced waters on marine organisms have not been reported. Field studies have shown the potential for bioaccumulation of petroleum hydrocarbons from produced waters. The estimated 4.35 X 107 bbl of produced water that would be discharged from the proposed platform would be a moderate impact because of the significant increases in trace metals (Tables IV.B.7.a.(3)(a)-1 and IV.B.7.a.(3)(a)-2) and dissolved hydrocarbons that would occur to the local receiving waters.

The development of offshore oil and gas carries with it the risk of oil spills at the platform and in transporting the oil to shore. Based on the latest estimates of sources of input of petroleum to the marine environment (National Research Council, 1985), only about 1.5 percent results from spills and opera-tional discharges of offshore production. About 45 percent of all petroleum entering the sea comes from transportation, including tanker operations, dry docking, marine termimals, bilge and fuel oils from all ships, and accidental spills from all vessels. The number and probability of accidental spills greater than 1,000 bbl that will occur as a result of the project are very small (number, 0.22; probability, 0.10). In the event of a spill, the fate and effects of the oil are

TABLE IV.B.7.a.(3)(a)-1

AMBIENT TRACE METAL LEVELS AND MAXIMUM TRACE METAL LEVELS THAT PRESENT MINIMAL RISK TO MARINE AQUATIC LIFE

California Ocean Water		Marine Aquatic Life
Concentration[a] Total Trace Metal	Ambient Ocean Water	Maximum[b] Concentration that Presents Minimal Risk of Deleterious Effects to Marine Aquatic Life
Trace Metal	Surface	
Cadmium	0.004-0.025 ug/l	0.2 ug/l
Chromium	No data	0.05 mg/l
Copper	0.1 ug/l	0.01 mg/l
Lead	0.005-0.015	0.01 mg/l
Nickel	0.200	2.01 ug/l
Silver		1.0 ug/l
Zinc	0.005-0.030	0.2 ug/l

[a] Personal communication: Dr. K. Bruland, 1979.

[b] National Academy of Sciences - National Academy of Engineering, 1972.

TABLE IV.B.7.a.(3)(a)-2

COMPARISON OF ESTIMATED MAXIMUM SEAWATER CONCENTRATIONS OF TRACE CONTAMINANTS FOLLOWING 1,000-FOLD DILUTION OF CALIFORNIA OFFSHORE PRODUCED FORMATION WATER WITH EPA WATER QUALITY CRITERIA OR LOWEST REPORTED CONCENTRATION OF EFFECT (FEDERAL REGISTER, 1980)

Trace Constituent	Estimated Maximum Concentration After 1,000-fold Dilution	EPA 24-hour Criteria (ug/1)	Lowest Repoted Concentration of Effect (ug/1)
Arsenic	0.08 ug/1	NE[1]	40[2]
Cadmium	0.18 ug/1	4.5	
Total Chromium	0.04 ug/1	18	
Copper	0.116 ug/1	4.0	
Lead	0.28 ug/1	NE[1]	25[3]
Mercury	0.002 ug/1	0.025	
Nickel	0.29 ug/1	7.1	
Silver	0.03 ug/1	NE[1]	2.3[4]
Zinc	3.2 ug/1	58	
Cyanide	0.004 ug/1	NE	2.0[5]
Phenolic Compounds	2.10 ug/1	NE	2,560[6]

[1] Saltwater criteria for 24-hour average not established.
[2] Short-term effect, freshwater species.
[3] Chronic effect, saltwater species.
[4] Maximum allowable (instantaneous) saltwater concentration.
[5] Projected chronic effect, saltwater species.
[6] Chronic effect, freshwater species.

subject to a variety of factors influencing the rate at which oil disappears from the environment, the populations of organisms affected, and extent of the impact of these populations. These interactions are very complex.

The type and quantity of spilled oil will influence the toxicity of the released hydrocarbons, crude oils being less toxic than refined petroleum products. Low molecular weight compounds and monoaromatic fractions have the most toxic effects on marine organisms because these compounds are the most water soluble. The season during which a spill occurs will determine the direction that the spill moves, the degree to which water quality is degraded and which marine organisms become exposed. Winter oceanographic conditions in the lease sale are characterized by high winds and large waves which result in greater mixing of the surface water than occurs at other times of the year. A spill occurring during the winter would be expected to disperse more quickly and have less impact on water quality than a spill during other seasons. However, wave action may intensify the problem if surf drives the oil spill ashore where the oil may accumulate in sediments and persist for long periods.

The hydrocarbons in crude oil are a complex mixture of thousands of types of simple carbon chains and complex branched and ring carbon structures. The persistence of these various classes of hydrocarbons in the marine environment differs and, therefore, water quality will be impacted to varying degrees as the oil spreads and "weathers." These weathering processes included evapora-tion, photochemical oxidation, dissolution, vertical dispersion, emulsification and sedimentation. Biological processes also act on different petroleum fractions in different ways, including degradation by microorganisms, uptake by larger organisms and subsequent metabolism, storage or discharge (National Research Council, 1985).

A very large literature is now available, showing that petroleum in the marine environment can elicit a broad range of toxic responses to many plants and animals at concentrations less than 1 mg/1. The National Research Council (1985) hsa concluded that all marine organisms readily accumulate petroleum hydrocarbons from the environment either directly from the water or through their foods, and that petroleum hydrocarbons can cause changes at cellular, organismic and community levels. Oil exposure can enhance susceptibility to disease, cause genetic effects and alter basic metabolism. However, there is no compelling evidence to indicate permanent damage from petroleum to any particular part of the ocean's resources, nor is there evidence of increased pathology in marine organisms due to petroleum alone.

Entire communities have been impacted or even eliminated by major oil spills such as from the supertanker Amoco Cadiz, but with time such communities do recover. Results of studies of the 1969 Santa Barbara Channel oil spill suggest that the effects would be short-lived in open ocean and somewhat longer along open coastal environments (Straughan, 1971). In general, recovery of the coast to prespill appearances would return within a year or two. Effects would be more severe if the oil entered wetlands or estuaries. In such cases, small, local pockets of heavy oiling might persist for many years before the water quality and the impacted community became stabilized (National Research Council, 1985).

Bottom sediments will be put in suspension during exploration and development activities with the emplacement of platforms and associated reentry colars, blow-out preventers and pipelines. Impacts associated with the resuspension of bottom sediments are increased turbidity and the potential for any pollutants in the sediments to be released into the water column.

The magnitude and extent to which sediment will be put into suspension depends on the sediment type and grain size, water currents and the duration of the activity. Anchoring of support vessels and the installation of subsea equipment will be short term and involve turbidity increases for a few days and be limited to several tens of meters. Pipeline burial will involve much larger volumes of sediment over periods of several weeks and, thus, involve much larger volumes of resuspended sediment. Sessile organisms within several meters of the activity could be buried. Turbidity increases would tend to initially decrease photosynthesis and result in a consequent decrease in phytoplankton productivity in shallow sunlit depths but have virtually no effect on phytoplankton at depths below 100 m. In shallow depths, phytoplankton growth might ultimately be stimulated as nutrients in the resuspended sediments became available and as the turbidity plume dispersed.

Turbidity plumes might temporarily disrupt the normal behavior (e.g. swimming and feeding) of zooplankton and fishes in the impacted area. Fishes might avoid areas of high turbidity but soon return to feed on (and be attracted to) benthic animals exposed by the sediment turnover.

The release of existing pollutants, including metals and pesticides, back into the water column as a result of sediment resuspension from exploration and development activities and their potential uptake and incorporation into the tissues of marine organisms is of relatively little concern because coastal and offshore sediments in the planning area are generally unpolluted.

A number of activities associated with the proposed offshore oil and gas development are likely to degrade the water quality of what is now relatively pristine oceanic waters in the Oregon and Washington planning area. The most significant of these anticipated effects are from discharges of muds and cuttings, produced waters, and the release of some hydrocarbons. Turbidity plumes may temporarily reduce phytoplankton growth and the normal behavior of zooplankton and fishes may be altered over short-term periods. Some sessile benthic organisms will be displaced and others will be buried in areas that are disturbed by subsea equipment and pipeline installation. The benthic community below the platform and within 150-200 m of the discharge will likely change as a result of alterations in sediment and habitat characteristics. The release of some toxic metals and hydrocarbons is expected but will not cause acute mortality because of rapid dilution and dispersion of the discharge plume (or resuspended sediment plume) over a wide area. Marine organisms are expected to incorporate some of the released metals and hydrocarbons into their tissues, which may result in subtle metabolic and biochemical changes of unknown significance; such effects will be restricted to the immediate vicinity of the platform and will not be measurable more than several km from the platform. The probability that the project would result in a spill of at least 1,000 bbl of oil is very low. Impacts to the open ocean would be low, but if the oil reached shore and entered estuaries, the impact could be very high.

CONCLUSION: Low impacts are expected from the activities associated with the proposal.

CUMULATIVE IMPACTS: Impacts on water quality from three platforms (two off Oregon, one off Washington), would be a multiple of the impacts associated with a single platform as discussed above. An estimated 544,000 bbls of muds and cuttings, and 135 million barrels of produced waters would be discharged to the ocean from three platforms. There is a likelihood of three oil spills of at least 1,000 bbl occurring.

Potential impacts associated with oil and gas development must be considered in the perspective of existing natural and anthropogenic effects on water quality parameters. As indicated above, the region is influenced greatly by the natural phenomena of upwelling and river discharges, which may have very profound effects, including changes in nutrients, pH, dissolved oxygen, turbidity and productivity. Millions of tons of suspended solids, including anthropogenic inputs from a variety of domestic and industrial wastewaters, agricultural runoff, logging and pulp mill wastes are carried into the sea each year by the region's major rivers. The discharge of domestic and sanitary wastes from three platforms is considered to be a very low to low impact. These materials are treated by an activated sludge system before discharge and the daily volume (14,000 liters) is small compared to the estimated 11 million liters of waste which now flows into the ocean off Oregon and Washington. The slight changes in seawater chemistry (e.g. nutrients) associated with the small volumes of these wastes would cause localized eutrophication, but would not be measurable several tens of meters from the discharges. The slow release of some metals from antifouling paints, corrosion electodes and from pipe joining compounds are considered to be significant, low impacts to the water quality. Sediment resuspension associated with the installation of subsea equipment and pipelines will bury some organisms and result in turbidity plumes, and these effects are temporary, very localized and are low impacts.

It would be valuable to assess the quantities of drilling muds, cuttings and produced waters and their respective components relative to existing loadings from natural and anthropogenic sources, but existing data for the coasts of Oregon and Washington are scarce. Loadings from particulate matter, hydro-carbons, and metals from river inputs, municipal sewage, industrial wastes and dredged material are expected to be high in comparison to normal operational discharges from three platforms. For example, while about 150,0000 tons of solids (from drill cuttings and drilling fluids) may be discharged from three platforms (assuming 25 wells/platform and 2,000 tons of solids from each well) during the life of the full development project, this quantity represents only 2.5 percent of the yearly load of solids deposited on the continental shelf by the Columbia River.

As indicated above, the level of impact of spilled oil to water quality would be low for the open ocean, but impacts would be moderate if some oil reached the open coast. Impacts would be very high if oil was driven into estuaries or other areas where local winds and currents would tend to contain or entrain the oil, i.e., the contaminant could persist for many months.

CONCLUSION: The overall impacts of oil and gas development in pristine waters off Oregon and Washington are expected to be moderate .

(b) Impacts on Air Quality

Air pollutants emitted as a result of typical oil and gas development on the OCS include nitrogen oxides (NOx), carbon monoxide (CO), sulfur oxides (SOx), total suspended particulates (TSP), and volatile organic compounds (VOC)*. Ozone (O3) is not emitted directly by any source, but is formed in a photochemical reaction in the atmosphere involving VOC, NOx, and other pollutants.

Sources of air emissions during the drilling of exploratory wells include diesel-fired engines that power the drilling units and engines that power the tug boats, crew boats, and supply boats. Pollutants primarily consist of NOx, with smaller amounts of CO, VOC, CO and TSP. During the installation of a platform, air emissions are associated with derrick barges, tugboats, and cranes. Pipe-line installation results in similar type of emissions, but total amounts are much lower since they occur over a much shorter period of time. The drilling of development wells is initially performed by diesel engines; however, once production starts, natural gas turbines are used. The largest contribution to air emissions during development consists of NOx, while emissions of CO, VOC, SOx and TSP are considerably smaller. However, NOx emissions are reduced substantially once the diesel engines are replaced by natural gas turbines. Table IV.B.7.a.(3)(b)-1 lists typical emission rates associated with exploraotion and development activities.

During oil and gas production the primary source of emissions is from natural gas turbines that provide power for oil pumping, water injection, and gas compression. The emissions consist primarily of NOx with lesser amounts of CO, VOC, TSP and SOx. Other sources of air pollutants include leakage of VOC vapors from oil/water separators, pump and compressor seals, valves, and storage tanks. Flaring may take place periodically to burn off excess gas, resulting in some emissions of SOx and VOC. If the gas produced is high in hydrogen sulfide (H2S), the gas would have to pass through a desulfurization unit. Onshore emissions result primarily from gas processing facilities. Table IV.B.7.a.(3)(b)-2 shows typical emissions from production activities in the case where oil is shipped to shore via pipeline.

If barges or tankers are used to transport crude oil to shore, emissions of VOC result from tanker loading operations. Emissions of SOx, NOx, and TSP from the ship's engines occur during loading operations, tanker transit,

Table IV.B.7.a.(3)(b)-1

TYPICAL ANNUAL AIR EMISSIONS FOR EXPLORATION AND DEVELOPMENT ACTIVITIES

	Pollutant Emissions (tons/year)					Notes
	VOC	NOx	SOx	CO	TSP	
Exploratory Drilling	28.0	175.6	14.0	34.0	14.0	NOx emission values for power generation from Radian (1982). All other emission values obtained from FSI (1983). Assumes four 10,000 ft. exploratory wells drilled, about 90 days for each well. Includes emissions from support vessels at site and during transit.
Platform Installation	8.5	192.0	13.0	34.4	10.7	Emission values from FSI (1983). Assumes a 6-month installation period. Includes emissions from support vessels.
Pipeline Installation	1.8	31.6	2.1	6.1	2.0	Emission values from FSI (1983). Assumes a 15-mile length of pipeline constructed over 15 days. Includes emissions from support vessels.
Development Drilling	7.9	106.2	4.7	40.4	5.1	Emission values from FSI (1983). Assumes 8 wells drilled per year. Includes emissions from support vessels.

Table IV.B.7.a.(3)(b)-2

TYPICAL ANNUAL EMISSIONS FOR OIL AND GAS PRODUCTION ACTIVITIES, PIPELINE SCENARIO

	Pollutant Emissions (tons/year)					Notes
	VOC	NOx	SOx	CO	TSP	
Offshore Platform	25.7	99.0	0.7	69.3	5.5	Emission values from FSI (1983). Assumes 12,000 barrels/day of oil and 16 million ft3/day of gas produced.
Support Vessels	0.9	42.4	2.9	6.4	1.9	Emission values from FSI (1983). Assumes one crew boat trip/2 days and one supply boat trip/2 days. Includes emissions during transit for a 50-mile round trip.
Onshore Gas Processing	5.5	175.1	0.0	7.0	0.08	Emission values from FSI (1983). Assumes 16 million ft3/day of gas processed.

and tanker operations in port. Emissions of VOC also occur during unloading and ballasting operations in port. Table IV.B.7.a.(3)(b)-3 lists typical emissions from pro-duction activities in the case where oil is transported to shore via tanker.

Impacts from offshore oil and gas development on onshore air quality are dependent on many factors including distance of the activity from shore, production rate, type of equipment used, mode of transport of crude oil, proximity to other oil and gas development activities, and degree of existing onshore air quality degradation. The emissions presented in Tables IV.B.7.a.(3)(b)-1 through IV.B.7.a.(3)(b)-3 are to be applied in a generic sense only.

Actual emission values can differ substantially depending upon number of wells drilled, oil and gas production rate, and type of equipment used. Expected impacts from the proposed 5-year leasing program cannot, therefore, be determined quantitatively with any degree of precision. Impacts are therefore described qualitatively, taking into consideration "typical" emission rates and development scenarios.

Impacts are evaluated using the California OCS air quality handbook (FSI, 1983), which presents expected impacts for a range of generic assumptions. The air quality impacts were calculated using EPA-approved Gausian diffusion models for "inert" pollutants (NO2, SO2, CO, and TSP) and photochemical trajectory models for ozone (O3). Impacts are evaluated by comparing calculated concen-trations with the Department of Interior (DOI) Significance Levels (30 CFR 250.57-1) and applicable State and Federal ambient air quality standards (AAQS). The DOI Significance Levels define concentration levels of pollutants from OCS sources above which the pollutants are deemed as significantly affecting onshore air quality (Table IV.B.7.a.(3)(b)-4). If these levels are exceeded in an attainment area (an area where existing air quality levels meet the Federal AAQS), the source would be required to be equipped with best available control technology (BACT). If the DOI Significance Levels are predicted to be exceeded in a nonattainment area (an area where existing air quality levels exceed the Federal AAQS), emissions would be required to be controlled or offset so that net emissions equal zero.

Exploratory drilling operations would result in a temporary source of air emissions, generally for about a 3-month duration at any one site. Because of the temporary nature of the emission sources and the generally favorable dispersion conditions found in the proposed project area, there would be only very small, localized concentrations of air pollutants. These concentrations would be well below DOI Significance Levels. No significant, adverse effects on air quality would be expected.

Development and production activities associated with the one platform projected for the lease sale area are expected to result in very small, localized increases in concentrations of air pollutants. These concentrations would be well below the DOI Significance Levels. Development and production activities also would not cause any significant increase in ozone concentrations. Photochemical trajectory modeling performed for a production platform located off the northern California

Table IV.B.7.a.(3)(b)-3

TYPICAL ANNUAL AIR EMISSIONS FOR OIL AND GAS PRODUCTION ACTIVITIES, TANKER SCENARIO

	Pollutant Emissions (tons/year)					Notes
	VOC	NOx	SOx	CO	TSP	
Offshore Platform	23.9	87.0	0.6	60.5	4.9	Emission values from FSI (1983). Assumes 12,000 barrels/day of oil and 16 million ft3/day of gas produced.
Offshore Storage and Transfer	158.3	2.2	10.2	0.5	1.2	Emission values from FSI (1983). Assumes 42 tanker trips/year.
Support Vessels	0.9	42.4	2.9	6.4	1.9	Emission values from FSI (1983). Assumes one crew boat trip/2 days and one supply boat trip/2 days. Includes emissions during transit for a 50-mile round trip.
Tanker Transit	1.1	25.7	91.6	1.8	5.9	Emission values from FSI (1983). Assumes 42 tanker trips/year, 600-mile round trip.
Tanker in Port	11.6	4.6	6.4	0.6	0.7	Emission values from FSI (1983).
Onshore Gas Processing	5.5	175.1	0.0	7.0	0.08	Emisison values from FSI (1983).

TABLE IV.B.7.a.(3)(b)-4

DOI SIGNIFICANCE LEVELS[1]

	Averaging Time				
Air Pollutant	Annual	24-hr	8-hr	3-hr	1-hr
Sulfur Dioxide (SO_2)	1	5	--	25	--
Total Suspended Particulates (TSP)	1	5	--	--	--
Nitrogen Oxides (NO_x)	1	--	--	--	--
Carbon Monoxide (CO)	--	--	500	--	2,000

[1] All concentrations are in micrograms per cubic meter.
-- indicated no standard exists.

Source: 30 CFR 250.57

coast indicated only a small increase in ozone levels under worst-case meteorological conditions with concentrations staying well below the federal ozone standard (FSI, 1983). No significant impacts would therefore be expected for any platform located off the Oregon or Washington coast.

Air emissions would also be associated with tanker unloading operations in the Puget Sound area. Portions of the Puget Sound area are presently classified as nonattainment for ozone, carbon monoxide, and total suspended particulates. Tankers operating in the area would be subject to emission controls as prescribed by the local air quality regulatory agencies. The most significant potential source of air emissions, release of hydrocarbon vapors during unloading, can be minimized by the use of vapor recovery systems. Tanker operations would not be expected to significantly affect local air quality. Some emissions may also be expected from crude oil storage, treatment, and refineries. It is difficult to predict emissions from refineries, since it would involve possible modifications of existing facilities. However, project emissions are not expected to result in any significant change in onshore air quality.

Air quality impacts form the proposed project would be low. (One small area within a Federal nonattainment area would be impacted by onshore sources. Few emission control strategies are likely). See Chapter VIII.A. for a complete list of air quality impact level definitions.

CONCLUSION: The proposed project would not significantly affect onshore air quality. Impacts on air quality would be low.

CUMULATIVE IMPACTS: Impacts were considered for a cumulative scenario which consisted of two additional platforms resulting from future 5-Year and a corresponding increase in oil and gas production rate. Air emissions would be spread over a larger area than would be the case for a single platform. How-ever, since the additional platforms would be likely to be spaced considerable distances apart, there would be little, if any, cumulative impacts among the individual facilities. Air pollutant concentrations from offshore sources would be well below DOI Significance Levels.

Air emissions from tanker operations, refineries, and other onshore facilities would result in no significant change in onshore air quality.

Cumulative air qualtiy impacts in the proposed project area would be low. (One small area within a Federal nonattainment area will be impacted. Few emission control strategies likely).

CUMULATIVE IMPACT CONCLUSION: The cumulative impacts from all future projected developments in the project area would be low.

(4) Biological Environment

(a) Impacts on Plankton

The impact on phytoplankton and zooplankton in the planning area will come from drilling muds, formation water (if it is discharged) sewage, and spilled hydrocarbons. These agents and their effects on plankton have been discussed in detail in past environmental impact statements (USDI, 1975b, 1979, 1980a, 1981). The deleterious effects of oil and gas activity on plankton populations, especially oil spills, is felt to be nonsignificant, due to the spatial and temporal variability of plankton in the marine environment (Strickland, 1967; Riznyk, 1977; Balech, 1960). Phytoplankton may experience small blooms in the areas around spills, not within the spills.

Plankton trapped within spills will experience mortality, but replacement by advected populations should occur rapidly after the oil has been dissipated, weathered or transported from the area. Plankton populations should recover quickly once the oil is removed. However, if a massive spill was trapped in an eddy system, such as might occur in the Santa Barbara Channel, it could produce significant impacts on the phytoplankton for a period long enough to affect zooplankton grazing on phytoplankton. Thus, zooplankton populations could be reduced, in turn affecting the carrying capacity of the marine environment for higher trophic levels for a particular year class. This scenario is thought to be unlikely, because the oil and gas formations known in the planning area do not seem to have estimated reserves to sustain a massive spill.

The impacts caused by the 10 exploratory wells and 29 development/production wells on a single platform would be very low in and only within the water affected by drilling muds, formation waters, sewage and small oil spills. One spill of 1,000 barrels is assumed. Should a large spill occur, impacts to plankton would be low within the water mass contacted by the spill. The overall impact to the plankton population would be negligible. If the large spill becomes trapped within an eddy system, impacts would be moderate. This type of impact is very unlikely since the oil and gas formation in the planning area do not seem to have estimated reserves to sustain a massive spill.

CONCLUSION: Impacts to plankton from normal operations will be very low.

CUMULATIVE IMPACTS: The total number of large 1,000 bbl or greater spills from all future, past and present oil activities estimated to occur is three. Impacts to the plankton population of the area would remain negligible even if all three large oil spills occurred a few months apart because impacts would be limited to the water pockets impacted by oil. The same would be true with impacts caused by the three platforms predicted. Impacts would remain very low since the plankton would be limited to relatively small water pockets within which muds are entrained.

CUMULATIVE IMPACT CONCLUSION: Impacts would be very low.

(b) Impacts on Benthos

(i) Intertidal

Impacts on intertidal communities in Washington or Oregon could be caused by oil spills from platforms, or tankers or the installation of pipelines. Drilling platforms and related activities are not expected to cause impacts to intertidal communities because they are three or more miles away. During pipeline installation, damage to the communities within an area about 20 meters wide would occur where the pipelines come ashore. From this type of disturbance should proceed normally within 2 years and with no toxic residues left in the area from the operation. A more detailed description of the generic impacts on intertidal communities is presented in the Central California Section IV.B.9.a(4)(b), BLM (1975, 1979, and 1980) and National Academy of Science (1975).

Impacts from a large oil spill would cause mortality to rocky shore intertidal organisms from smothering. Toxic related mortality is also possible, particularly if oil were to reach shore in a matter of hours. Since the coastline of Washington and Oregon contains many cliffs which are pounded by heavy surge, we can theorize that oil from a spill will not remain on the intertidal community for a long period. Impacts therefore should be somewhat less than on gently, sloping semi-protected coasts.

As with the other areas, the extent of damage to a sandy beach intertidal community from a large spill will be less than that to a rocky intertidal community. This would particularly be true of Washington and Oregon because of the high wave energy characteristic of these coasts.

The probability of a large 1,000 bbl or greater spill occurring is only 8 percent. Should a large spill occur and contact an intertidal area, the impacts would be similar to that discussed for the other planning areas especially northern California (see Section IV.B.8.a.(4)(b) because both areas have high wave energy.

CONCLUSION: Intertidal areas will experience low levels of impact.

CUMULATIVE IMPACTS: The total number of large 1,000 bbl or greater spills from all future, past and present oil activities estimated to occur is three. The impacts from a large oil spill reaching intertidal areas would remain low for most rocky intertidal and some sandy beach areas and moderate for more sensitive rocky intertidal areas. If two or more spills were to contact a rocky intertidal area on consecutive or alternate years, the impact would be very high. This essentially means that recovery would require over 10 years. Although the probability of such an occurrence is unkown, it is believed to be unlikely.

CUMULATIVE IMPACT CONCLUSION: The impacts to intertidal areas would remain low.

(ii) Subtidal

Activities which may adversely impact subtidal dwelling organisms include: emplacement of drilling platforms, discharge of drill cuttings and muds, pipeline construction, and oil spills. For further information on these impacts in general, refer to Sections IV.B.9 and 10.a.(4)(b) on subtidal benthos in southern California.

Washington and Oregon benthic areas have been discussed (see Section III.c.7.b.(b)). There are several shallow rocky bottom areas which may be sensitive to normal poduction development similar to areas in California.

The impacts caused by the 10 exploratory wells and 29 development/production wells on the single platforms would be very low for nearly all exploratory wells and very high in the immediate vicinity of production platforms. The life expectancy of production platforms is 25 years and the combined drilling and platform referred to above and summarized in Section IV.B.10.a.(4)(b) should last at least for the duration of the platform. One spill of 1,000 barrels is assumed for this analysis. However, should a large oil spill occur and contact a benthic community, the impacts would be low.

CONCLUSION: Impacts from the proposal will be very low.

CUMULATIVE IMPACTS: Impacts from three platforms rather than one will cause very high impacts immediately around three platforms rather than one platform. The impact on the ecology of the planning area would be low because the areas impacted by the three platforms are a very small part of the total primary area.

The total number of large 1,000 bbl or greater spills from all future, past and present oil activities is three (2.90) with a 92 percent probability of one or more large spills occurring. The potential impacts discussed above would remain the same (low), but the potential for such an event would increase significantly.

CUMULATIVE IMPACT CONCLUSION: Impacts would remain low.

(c) Impacts on Fish Resources

Implementation of the proposal will result in activities occurring which have the potential to impact fish resources.

Acoustic exploration involves generating a sound and recording its echos from geologic strata. In the marine environment the sound is usually generated by an acoustic generating array towed behind a ship. This activity may detrimentally impact fish populations that are sensitive to the wavelength of sound generated. Potential impacts include disruption of adult feeding, schooling, or breeding activity, either by the sonic waves, the tow equipment, or ship passage. Eggs and larvae may be killed, maimed, or have their activity disrupted by sonic waves.

Exploration by drilling has different potential impacts. Discharged drilling muds may physically smother benthic fish or their food producing or spawning areas. Certain muds may contain compounds which are toxic to fish or other marine life in their food chain. Plumes of discharged muds, suspended in the water column, may preclude fish movements or interfere with predator feeding or prey escape mechanisms.

Depending on the type of platform selected there could be negative impacts to benthic species from platform settling and anchoring. There may also be impacts from the number of wells drilled. These would be similar to, but 30 to 80 times as great as, those for drilling a single exploratory well. Effects could be compounded because of the proximity of the holes to each other, or they could be reduced through the use of a common dump site. Other factors which could modify these impacts include accumulated depth of disposed muds, dispersal of muds through time by currents, and reoccupancy of deposition areas over an extended drilling period. Groundfishes and benthic crustaceans and molluscs are most susceptible to these impacts. Very low impacts are most likely to occur as a result of the proposed action.

The platform itself may serve as an artificial reef, attracting a community of attached organisms and those that would use it as shelter, as well as those that would feed on the attracted organisms. Trenching for, and laying of pipe may move or resuspend sediment which may smother fish or food organisms when it resettles.

Spilled oil could have a significant impact on salmon and other anadramous fishes. These fish use chemical cues to return to their spawning streams (Fry, 1973) and oil could interfere with their olfactory senses. Impacts could be especially severe during smolting when the young fish first enter the ocean, and when trying to locate their home drainage while returning to fresh water to spawn. A large oil spill, if occurring at a time and location such that a year-class of salmon is prevented from smolting or spawning, would have severe local impacts for up to five years (one generation of chinook salmon) or longer until overlapping year classes or fishery managers are able to successfully restock a stream. However, planning area-wide salmonresources are unlikely to be seriously impacted unless a major source (Columbia River, Puget Sound-Frazer River) was decimated which is a very unlikely event.

Among other fishes, those that live closest to the surface (herring, anchovy), closest to the bottom and are sedentary (eels, blennies, sculpins), and those with planktonic egg and/or larval stages (many species) are most susceptible to spilled oil. Spills that reach spawning or nursery grounds will have the severest impact, while those that affect non-breeding behavior of adults will have the least long-term impact. However, the wide distribution of nearly all fish species in both space and time precludes impacts on a planning area wide basis beyond a low level. Given the one oil spill greater than 1,000 assumed in this analysis, impacts on fisheries would be limited to the areas affected by this assumed oil spill.

CONCLUSION: Planning areawide impacts as a result of the proposed action are expected to be low.

CUMULATIVE IMPACTS: Long term impacts to fish resources as a result of OCS activities will be similar to the base case impacts, but spread over a longer time frame, and may occur to a greater degree. Any impacts occurring to fish resources as a result of petroleum leasing and related activites will be in addition to those negative impacts associated with other factors, both natural and cultural.

The OCS activites resulting from lease sales in this proposal may be expected to occur for as long as 25 to 50 years if significant discoveries are made. Significant finds will also result in a large number of offshore facilities being installed and an increase in OCS related vessel traffic.

Both of these factors will service to increase the possibility of an oil spill happening.

Due to restricted populations and complex life histories, salmonids would probably be most severely at risk to increased negative impacts. Local populations could be impacted to a vey high degree. Because of numerous populations and overlapping life cycles of different generations the net effect is expected to be low.

Local populations of dungeness crabs could also be affected to a very high degree because of annual population size variation. This would be especially true if succeeding severe impacts occur to a concentrated population, especially while in the planktonic, larval state. However, due to a wide range and high reproductive potential, overall net impacts are expected to be low or very low.

Flatfishes with discrete spawning areas (Dover, rex and petrale sole, Pacific halibut) could suffer a high degree of impact if offshore facilities disturbs their critical habitat areas. Because of the location of these areas with respect to those of possible OCS development (areas believed to contain economically recoverable reserves) the overall net cumulative impacts are expected to be low or very low.

Rockfishes, because of their planktonic eggs and larvae, could be moderately impacted, but large population sizes indicate a more apt impact level of very low. Anchovies, herring, and sardines should be similarly affected for the same reasons.

Other fish species are not expected to be negatively impacted, but some may incur very low losses.

CUMULATIVE IMPACT CONCLUSION: Overall, marine fishes of Oregon and Washington are expected to incur a low level of impact.

(d) Impacts on Marine Mammals

Discussion: Primary sources of impacts to marine mammals include 1) noise and disturbance, 2) vessel traffic, and 3) accidental oil spills. The potential for impact of noise on marine mammals depends on two primary factors 1) characteristics and transmission of the noise, and 2) behavioral and physiological sensitivity of affected species. (57, USDI, 1981.) Noise above certain levels has been shown to disturb whales, although levels, frequencies, and types of noise that cause disturbance vary from species to species, area to area, and season to season within a species range. Disturbance would be demonstrated by a change in the behavior of a particular whale, including leaving an area to reduce exposure to noise. Such movements are not necessarily detrimental, however, it may be assumed that a population will occupy its optimum habitat and a movement away may not be beneficial.

Helicopter noise could have adverse effects on marine mammal breeding and hauling activities within the Planning Area. Several mammals are known to stampede from an area when disturbed by low-flying aircraft. Such mass exodus may result in the separation of mother-pup pairs. The separations may reduce or eliminate the pup's chances for survival depending upon whether or not mother-pup recognition was firmly established. Stampedes have also been noted to result in injuries and death to young animals. Repeated disturbances may lead to abandonment of traditional breeding or hauling areas in favor of less suitable sites.

The effect of underwater noises generated by oil and gas activities on marine mammals is not well understood. The response of whales to acoustical stimuli has generally shown variability in behavioral and physiological effects, depending on the species characteristics of stimuli, season, level of ambient noise, previous exposure of the whale, and the physiological or reproductive state of the whale. Studies of the acoustical activities of marine mammals suggest that an animal's acoustical system provides information on a variety of functions related to feeding, social activities and breeding. Both biological and non-biological noises may be perceived as threatening, causing in a retreat or flight reaction, or non-threatening with no observed changes in the animal's behavior. Noise from normal activities is expected to cause very low impacts to most marine mammals. Cetaceans, especially gray whales are more likely to experience low impacts from noise due to the proposal.

Several of the marine mammals are considered to be "unlikely visitors" to the Oregon/Washington coastal areas proposed for leasing since the areas are well north of their normal range (Mesoplodan densirostris and M. ginkodeus; common, bottlenose, and striped dolphins; and dwarf sperm whales, and northern and southern sea otters). Any impacts that the comparatively few individuals of these species or population numbers. Overall, impacts from normal activities associated with this proposal are considered low.

Beaked whales belonging to the genus Mesoplodon (most likely M. carlhubbsi and M. stynegeri), pilot whales and pygmy sperm whales are probably the most vulnerable to sustaining impacts from vessel collisions due to their tendency to sleep, rest or loll montionless at or near the surface. Seals, sea lions, and northern sea otters could also be susceptible to collisions while feeding, migrating, drifting or rafting offshore. Harbor propoises and Minke whales may be vulnerable to collisions due to their comparatively slow swimming speeds and possible attendant difficulties in evading fast-moving vessels.

Most marine mammals live and reproduce in the ocean or on islands and remote parts of the coastline. Overall, impacts to marine mammals from normal activities will probably be low for pinnipeds and low to moderate to cetaceans.

Accidental oil spills could have adverse impacts on marine mammals if contact was made with an animal. Over the life of the proposal, production of the estimated oil and gas resources is assumed to result in one oil spill greater than 1,000 barrels of oil, Given that a spill occurs and containment efforts are unsuccessful, impacts to marine mammals contacting oil could be locally high, but probably regionally low to moderate for most species. The primary direct effects of an accidental oil spill on marine mammals include 1) the potential coating of the animal with oil and potential loss of insulation, 2) ingestion of toxic compounds, and 3) interference with behavior due to olfactory disturbances. Hair seals and sea lions would probably not suffer any serious thermal effects from oiling since their insulation is provided by a thick layer of blubber. An exception would be hair seal pups which have not yet developed a thick subcutaneous fat layer. On the other hand, fur-insulated animals such as the sea otters and northern fur seals are known to suffer from significant metabolic rate increases, serious hypothermia problems due to pelagic degradation and subsequent wetting, and mortality from oiling. The stress of increased maintenance associated with oil contact are likely to have adverse effects on the health of these animals especially when other environmental stresses such as pregnancy, lactation, fasting, molting, food shortages and severe wether are considered. It has been suggested that even light-oiling may have detrimental effects on fur-insulated mammals and hair seal pups, while effects on other adult pinnipeds may be slight. Marine mammals may incidentally ingest oil while mothers are nursing pups. Studies have suggested that toxic effects of ingested oil on some mammals are probably negligible in the short term, but the effect of chronic exposures to oil are uncertain. Interference with behaviors such as the recognition of pups by females using scent may occur if oil contacted a hauling or breeding area. This could have the most serious impacts to sea lions and other pinnipeds since lack of recognition during nursing periods could lead to abandonment and starvation of young.

Fresh oil that is swallowed may be somewhat toxic to all whales. There is also evidence that oil fouling of the baleen plates of the great whales, including the gray, blue, fin, and sei, may temporarily reduce feding efficiency. (See appropriate sections of the USDI, 1981 and National Academy of Sciences, 1982, for a more detailed discussion of oil impacts.)

Mechanical cleanup equipment may be used to reduce oil impacts. Dispersants may be used to speed weathering of the oil and reduce impacts. Oil dispersants may, however, have more harmful effects on marine mammals than the oil itself (Dye, 1980).

Indirect impacts would occur if the availability of food resources of mammals were depressed or contaminated by an oil spill. Those species, such as sea otters, which feed on sedentary benthic prey would probably be the most likely to be affected. Mammals would probably avoid these areas temporarily, with negligible impacts. If, however, the impact is long term, more serious affects could occur if traditional breeding, hauling or foraging grounds or migration routes were abandoned in favor of less suitable areas.

Given the level of potential impact causing agents attendant to the proposal, (one sale, one oil spill greater than 1,000 barrels, 10 exploration well, 29 production well, one platform and one pipeline to shore) the expected impacts on the marine mammals of the Washington and Oregon planning area would be limited to sublethal effects on most species, and mortality of a few individuals among the more vuneralbe species.

CONCLUSION: Overall, impacts from normal activities associated with this proposal are considered low.

CUMULATIVE IMPACT DISCUSSION: The cumulative effect of OCS activities on marine mammals would probably have low to moderate levels of impact similar to, but greater than, what is projected for the proposal. Three platforms are required to develop the resources in the cumulative, instead of one. Potential impacts The MMS has recently announced plans for leasing areas off Oregon for mining of polymetalic sulfides. This project will contribute to underwater noise and disturbance offshore of many marine mammal habitats and migration routes. Depending on the intensity of offshore oil and gas exploration activities (especially seismic work), mining operations (especially the use of explosives) and the vessel and air traffic associated with both projects, impacts to marine mammals due to increased noise and disturbance) could range from locally high and regionally moderate in the short term to locally moderate to regionally low in the long term. Cumulative impacts to migrating species will probably intensify due to other oil and gas activities within their range to the north and south, including the OCS activities off California and Alaska. Noise levels are expected to increase throughout much of the range of these species.

With or without the proposal, some marine mammals are expected to suffer low impacts over the life of the proposal. Migrating species are subjected to stresses from municipal and industrial discharges and other human activities, including existing oil and gas operations throughout their range. Although waters off Oregon and Washington are relatively clean, migrating species may suffer low level impacts and a general degradation of health is possible. Overall, impacts are expected to be regionally low to moderate and most species are expected to maintain viable populations.

Based on the total resource estimate, the most likely number of spills greater than 1,000 barrels of oil is one. Tankering of foreign oil (2 spills expected) and domestic oil (1 spill expected) are the greatest sources of risk in this area. Marine mammals could sustain regionally low to moderate impacts.

Cumulative impact conclusion: The cumulative impacts from the proposed OCS lease sales in the Oregon/Washington Planning area, combined with other OCS activities within the range of migrating species of marine mammals will cause low impacts to marine mammals in the region.

(e) Impact on Coastal and Marine Birds

Marine and coastal birds may be vulnerable to several potentially adverse impacts from OCS oil and gas activities associated with the proposal.

Noise and disturbances due to the operation of seismic survey vessels, crew and support boats, drillships and helicopter overflights are likely to occur as the result of the proposal. Offshore coastal and marine birds could experience an interruption of resting and feeding areas. Coastal birds may experience physical disturbances from vessel traffic nearshore and physical disruption. Noise or loss of habitat areas for feeding or nesting could occur in onshore areas due if the source of noise occurs near a nesting area, birds may flee their nests leaving the eggs or young vulnerable to environmental hazards and predation. Many estuaries in Oregon/Washington are already affected by their use as harbors. Potentially adverse impacts can be avoided by careful siting of onshore and nearshore activities.

The potentially most detrimental impact to coastal and marine birds would occur if contact was made with an accidental oil spill. Direct contact with oil could result in the matting of plumage which can reduce flying and swimming abilities, loss of buoyancy which can inhibit the ability to rest or sleep on the water, loss of insulation which can cause death from exhaustion, and increased physiological stresses and reproductive failures due to oil ingestion or accumulation of toxic petroleum hydrocarbons. Most incidents involving ingestion of oil by birds apparently occur during preening (Nero and Associates, 1982). Acute toxicity may result. Birds that do not die from ingested oil would likely suffer reduced health, and generally animals in poor condition do not survive very long in the natural environment. The level of mortality due to the toxicity of oil cleaned from feathers or ingested with food is uncertain. However, these impacts could add to the direct contact effects and delay recovery time. These effects may be compounded during the nesting season if adult birds transfer oil from their plumage to unhatched eggs or chicks causing mortality. Longer term or sublethal effects of oil include delayed and depressed egg laying, reduced hatching and reduced growth rate due to poor nutrient uptake.

Alteration of a species' habitat, prey availability, or disruption of essential activities also can adversely effect marine and coastal birds. Contamination of a feeding area with oil such as an estuary or wetland, would be considered an indirect impact but still could be high.

Over the life of the proposal, production of the estimated resources is expected to result in one spill greater than 1,000 barrels of oil. Given that a spill does occur and containment efforts are unsuccessful, locally high impacts to avian fauna could occur. If a spill entered any of the wildlife refuges or estuaries along the coast a large number of migrating birds would be adversely affected. Among the marine and coastal birds which occur along the coasts of Oregon and Washington, the diving species and species that spend most of the time on the water's surface have a much greater risk of contacting oil. Populations of several of these species are very slow to replace lost numbers because of their low reproduction rates, therefore, oil spill mortalities could result in both short- and long-term adverse effects. The endangered California brown pelican is reported to feed on small fishes in several of these coastal estuaries. Water birds such as gulls, terns, petrels and plovers which are known to nest on islands of the coast (Leach's storm-petrel, tufted puffins, Cassin's auklet), along the coast on sandy beaches (Snowy Plover) and inside harbors (Pigeon Gillemot, Caspian Tern, cormorants) may also suffer locally high impacts if oil contacted these areas. Because birds vary in their seasonal occurrences, vulnerability to oil and their distributions at sea, impacts should not exceed regionally moderate significance.

CONCLUSION: Impacts to marine and coastal birds as a result of normal activities associated with this proposal are considered low.

CUMULATIVE IMPACTS: If all resources of the Oregon/ Wasinginton Planning Area are leased and developed over the life of the proposal and in the future, the cumulative effect of OCS development activities on marine and coastal birds would probably have low to moderate levels of impact similar to but greater than what is projected for the proposal. Total resource development assumes that three platfroms are required to develop the resources. Potential impacts from normal activities to marine and coastal birds would probably increase but remain very low. Platform discharges are not expected to have effects on marine and coastal birds although prey species of some birds may be affected (see Fishes, Plankton). Overall, impacts are expected to remain very low from normal activities.

The expected number of oil spills greater than 1,000 barrels is one. This increment of risk is considered very low when compared to the cumulative estimate of three spills from all sources in this Planning Area. Most of this risk is contributed by marine tankering activities. Could elevate significant impacts at least one level due to the inability of a population to recover before a second event.

Some marine and coastal birds are expected to suffer low impacts over the life of the proposal. Migrating species are subjected to stresses from anthropogenic sources throughout their range. Loss of important habitat is probably the most serious of these impacts. The MMS has recently announced plans for leasing areas off Oregon for mining of polymetallic sulfides. These proposed leases are offshore (20-200 nautical miles) and in deeper waters (1,000-4,000 meters) than areas considered for oil and gas leasing. The cumulative effects of noise and disturbances from vessel traffic resulting from this proposal, when added to OCS mining activities, could result in locally moderate impacts to marine birds, especially if shared supply bases are utilized and located near areas of diverse bird populations. Long-term noise disturbance could result in the loss of nesting habitats and overall higher impacts.

Non-OCS activities that contribute to cumulative impacts to avian species include the continued growth and development of nearshore and onshore feeding and breeding habitats which reduce the available habitat for coastal birds and increase pressure on refuge areas. Those species which migrate as far south as Central and South America could be exposed to toxic substances which are widely used, like DDT, that inhibit reproduction. Chemical wastes from designated ocean dump sites could have adverse effects if ocean water quality is degraded.

CUMULATIVE IMPACT CONCLUSION: The cumulative impacts from the proposed OCS activity in the Oregon/Washington area combined with non-OCS activities are expected to have low impacts to avian resources inhabiting the region.

(f) Impacts to Threatened and Endangered Species

Impact sources to threatened and endangered species would be similar to, those on coastal and marine birds and mammals. Those species listed as threatened or endangered are already reduced in numbers and an adverse impact to individuals of these species would be more significant than individuals of non-threatened or endangered animals. Primary impact producing agents have been discussed for marine and coastal birds or marine mammals as appropriate. Formal Section 7 Endangered Species Consultation by MMS with NMFS and FWS for the Washington and Oregon has not occurred in the past since no lease sales were held in theis area.

Recently, MMS prepared a request for information concerning the proposed 5-year OCS oil and gas lease sale program. A response from NMFS dated November 6, 1985 is included in Chapter V. Specific effects for species in the Oregon/Washington area are discussed below:

Table IV.B.7.a(4)(f)-1 provides a summary of potential impacts on west coastal endangered and threatened species.

Oregon Silverspot butterfly - Critical habitat for this species occurs along the Oregon coast. Unless onshore support or processing facilities are located nearby, the Oregon Silverspot butterfly is unlikely to contact any activities resulting from this proposal.

Sea turtles - Normal activities associated with the proposal are not likely to adversely affect any threatened or endangered turtles since most individ-uals are distributed in warm tropical or subtropical waters far to the south of the Planning Area. The few individuals sighted off Oregon/Washington are probably vagrants at the extreme northern limits of their ranges. Accidental vessel collisons and oil spills could have adverse impacts to these individual turtles. Marine turtles have been found ashore fouled with oil following large oil spills. Young turtles have been recovered having ingested tar which sealed their mouths and interfered with normal feeding. It is likely that those individuals contacted by oil would perish. The probability of a spill occurring and contacting one of the few individuals in this Planning Area is very low.

Although unlikely, individuals feeding or festing near the surface may exper-ience collisions with support vessels. The leatherback sea turtle is probably the most vulnerable since it feeds on the surface at night. Collisions would probably be fatal. Loss of a few turtles due to an accidental oil spill or vessel collision would have locally very high but probably regionally low significance.

California brown pelican - Impacts to the brown pelican from normal activities are expected to be very low. This species does not nest in the Oregon/Washington Planning Area and is not an abundant forager in these waters. In the event a spill occurred impacts to this species could range from low to moderate due to its high sensitivity to oiling. Brown pelicans observed in this area are reported to feed extensively in coastal estuaries and lagoons. If containment efforts failed to keep oil from these areas and important prey species were depressed or contaminated, indirect impacts to this species would also occur. A large oil spill that entered an estuary could destroy feeding areas for several years. Due to low numbers of pelicans expected in this Planning Area, and the absence of breeding efforts, impacts would probably not exceed region-ally low significance.

Table VI.B.7.a(4)(f)-1

WEST COAST ENDANGERED SPECIES
PLANNING AREA IMPACTS-WASHINGTON/OREGON[1]

	Degree of Concentration in Planning Area[2]	Sensitivity to oil[3]	Planning Area Impacts in the event a large spill occurs and contacts[4]	Potential Noise and Disruption Impacts from Offshore activities[5]	Overall Estimated Impacts in the Planning Area from Proposal[6]
Oregon silverspot butterfly	Hi	NA(2)	--	Vlo	NoAf
Sea turtles[8]	Vlo	Lo	Lo	Vlo	NoAf
Least terns	NA(1)				
California brown pelican	Lo-Mod	Hi	Lo-Mod	Lo	
American peregrine falcon	Lo	Hi	Lo-Mod	Lo-Mod	
Bald eagle	Lo-Mod	Hi	Lo-Mod	Lo-Mod	
California clapper rail	NA(1)				
California black rail	NA(1)				
Light-footed clapper rail	NA(1)				
Aleutian Canada goose	Hi	Hi	Vlo	Vlo	Vlo
Salt-marsh harvest mouse	NA(1)				
Morro Bay kangaroo rat	NA(1)				
White-tailed deer	Mod	Mod	Lo-Mod	Vlo	NoAf
Southern sea otter	Vlo	Hi	Lo-Mod	Vlo	NoAf
Gray whale	Mod	Lo	Lo	Lo	Lo
Other whales[7]	Lo	Lo	Lo	Lo	Lo
Salt-marsh bird's beak	NA(1)				

Table VI.B.7.a(4)(f)-1 (Continued)

1. Impacts are from offshore activities and oil spills only and do not include onshore activities which are regulated or permitted by other agencies. See discussion of individual species for clarification.

2. Degree of concentration: Hi=single site; Mod=two to several sites with concentrations of animals; Lo=well dispersed without concentrations of animals; NA(1)=doesn't occur in Planning Area.

3. Level of mortality or affect from contact or ingestion NA(2)=not applicable; oil spill won't contact species habitat.

4. Impacts are those impacts likely to the Planning Area population in the event there is a large oil spill in the vicinity when animals are present. The spill may be one that occurs nearby or one that occurs at some distance and travels to areas utilized by the Species. (Impacts may be less than potential impacts due to inaccessibility or habitat or behavioral characteristics of species.)

5. Noise and disturbance includes seismic, platform, boat and aircraft traffic to and from shore, and miscellaneous activities offshore. NA(2)=not applicable, offshore activities won't occur in species habitat.

6. Estimated impacts due to the proposal takes into account the number of spills expected to occur at the sites occupied by the species. Only significant impacts are tabulated. NoAf=no affect. For other levels see impact definitions.

7. Other whales are the humpback, blue, fin, sei, right and sperm whales.

8. Sea turtle species are green, Pacific Ridley, leatherback and loggerhead.

9. High level of impact applies only to areas around nesting colonies.

American peregrine falcon - Impacts to the peregrine falcon from normal activities are expected to be very low. Peregrines are considered uncommon residents and winter visitors to the Oregon/Washington area. Important wintering areas are intertidal mudflats and estuaries including Skagit Flats, Grays Harbor, and Willapa Bay. Construction of onshore support facilities could cause noise and disturbance impacts to breeding peregrines if sites were located near a nesting area. Careful planning can effectively avoid this impact. In the event a spill occurred, peregrines are most likely to experience the indirect effects of reduced or contaminated prey availability than direct contact with oil. Peregrines generally feed by knocking down flying birds and catching them mid-air. One of the significant consequences of oiling seabirds is their loss of, or reduced ability to fly. Peregrines could be oil-fouled by capturing an oiled bird. This is probably an unlikely event. Loss of a breeding peregrine pair could have locally very high and regionally high impacts.

Bald eagle: Impacts resulting from this proposal to bald eagles are expected to be very low from normal activities. As noted for peregrines, bald eagles are not expected to experience any direct impacts from an accidental oil spill. Bald eagles feeding in coastal waters have largely a fish and fowl diet and would be vulnerable to oiling by eating oiled prey. Like the peregrine, bald eagles are very sensitive to oil. If an accidental oil spill occurred, impacts could range from regionally low to moderate significance.

Southern sea otter - This species is not known to occur in the Planning Area. The small population of otters reported around Destruction Island, Washington, is more likely derived from the northern sea otter population translocated to Oregon over a decade ago. If the Oregon coast is selected as the trans-location site for the USFW's translocation project, reevaluation of the risks posed by this proposal would be necessary.

Gray whale - The gray whale population is likely to experience impacts from normal activities associated with the proposed OCS leasing activity. Many of the sounds produced by OCS activities are within the frequency range of sounds produced by, and therefore, assumed to be heard by the California gray whale. Due to its nearshore migratory pathway, the gray whale is the most likely of the endangered mysticetes to be affected by these noises. Available information (Bolk, Bernack and Newman Inc. 1983; Gales, 1982) indicates that gray whales may respond to the most intense of these sounds by short term changes in swimming speed, altered surface behavior, and small deflelctions in course. The most severe reactions are associated with a startle response such as when a seismic vessel initiates a survey in the vicinity of a whale. This typically consists of milling behavior for a short period and then resumption of the migration past the source of the noise. The typical response of whales approaching an existing noise source is to adjust their course so that they pass by the source at a distance of about 200 yards. These minor course changes to avoid noise are not likely to have significant adverse effects on migrating gray whales. Blasting associated with construction activities could cause physical injury or hearing loss to gray whales. The National Marine Fisheries Service has recommended precautionary measures to avoid adverse impacts from explosive use.

In the event a spill occurred, regionally low to moderate impacts could occur. Observations of migrating gray whales near natural oil seeps have shown that whales would typically swim through the oil, sometimes modifying their speed, but without a consistent pattern. However, whales were noticed to spend less time on the surface and breathe at a faster rate.

Gray whales feeding in the area of a spill are likely to ingest oil-coated or oil-contaminated food, particularly zooplanktons which actively consume oil particles. Potential impacts to this species from ingesting oil are unknown. The probability of a spill occurring is very low (8%). A large segment of the gray whale population could contact oil if the spill occurred during migration. Impacts could range from regionally low to moderate.

Other whales - Impacts to the other whales are projected as low due to the few individuals of each species which are likely to be in the Oregon/Washington lease area at any one time. Short-term impacts due to noise are considered likely due to increased vessel and helicopter traffic, seismic survey activity during exploratory activities. Available literature (Geraci and St. Aubin, 1980; Bolt Beranch and Newman, 1983) suggests that effects of seismic air guns on marine mammals are generally negligible or none at distances of about 5 kilometers or more. Drilling and production noise from one platform are not expected to cause significant changes in the behavior of whales that occupy this area seasonally, or otherwise. In the event a spill occurred, whales could experience mortality and physiological stress from the oiling. This could have locally high impacts. Locally high impacts to the northern right whale would have regional significance due to its very small population.

Aleutian Canada goose - This species is only occasionally found in coastal areas and is therefore unlikely to be exposed to activities related to this proposal. If a spill occurred and contacted shore, individual birds may be impacted if they are present. Impacts could be locally high, but regionally low.

Columbian White-tailed deer: This species is unlikely to be effected by normal or accidental activities associated with this proposal. Deer utilize low wetland areas of the Columbia River for feeding. It is unlikely that an oil spill would impact these areas.

CONCLUSION: Impacts to endangered and threatened species as a result of this proposal are considered low.

CUMULATIVE IMPACTS: Potential impacts from normal activities to threatened and endangered species would probably be very low. Species which are more sensitive or numerous, both in the lease area and near support bases, are especially vulnerable to increased activities such as air and vessel traffic. Of particular concern to threatened and endangered species are increased noise and disturbance (particularly from seismic operations, support vessels, and platform operations) potential vessel collisions, and the increased risk of an oil spill. The expected number of oil spills greater than 1,000 barrels from the proposed is one.

Impacts from this proposal, when added to projected impacts from other OCS programs (especially noise and disturbance) in the Oregon offshore, could cause locally high impacts in the short-term and regionally moderate impacts in the long term to threatened and endangered species. Increased noise and disturbance from air and vessel traffic and operational noise from the three platforms expected are expected to cause moderate impacts to species inhabiting coastal waters (gray, humpback, and fin whales) and surface-frequenting or feeding species offshore (sperm, blue, and right whales, leatherback turtles). Noise impacts are likely to have regionally low impacts on most species, but regionally moderate impacts to gray whales due to their abundance and exposure to other OCS activities along their migration route.

Collisions between support vessels and gray whales range from possible to probable due to the large numbers that migrate through the Oregon/Washington coastal waters. Other species which are less abundant in the area, such as sperm and right whales and leatherback turtles, also would have an increased risk of being struck due to their slow swimming capabilities and habits of sleeping, resting, or feeding at or near the surface. Collisions between vessels and threatened or endangered marine and coastal birds is still considered possible but unlikely.

The expected number of oil spills from all sources is three. Several threatened or endangered species are very sensitive to oiling and could suffer high impacts if they contacted oil. The increment of risk that this proposal contributes to the cumulative risk of an oil spill is considered low in terms of existing risks from foreign and domestic tankering. Those species which pass through other areas with potentially high risk of an oil spill (such as California) are most vulnerable to high impacts from a spill. For example, the coastal migration routes of the California gray whale which could subject a large segment of the population to an oil spill. The Brown pelican is also exposed to risks from an oil spill throughout much of its range, including its breeding areas in southern California. Species which occur infrequently within areas of potential oil spill risk would be more likely to sustain low impacts from an oil spill due to the number of individuals potentially impacted.

With or without the proposal, threatened and endangered species are expected to suffer low to moderate ecological losses over the life of the proposal. Migrating species are subjected to stresses from anthropogenic sources throughout their range. Loss of habitat and human disturbance contribute to these impacts. Overall, cumulative impacts are expected to be low to moderate and most species are expected to maintain viable populations.

CUMULATIVE IMPACT CONCLUSION: The cumulative impacts from the proposed OCS activity in the Oregon/Washington area combined with non-OCS activities will have a moderate impact to threatened or endangered species.

(g) Impacts on Estuaries and Wetlands

Estuaries and wetlands are critical areas of high productivity and contain distinct assemblages of fish, birds, invertebrates, and plants. The estuarine intertidal and subtidal benthic community plays an important role in the overall ecology of an estuary. Any event which destroys a large proportion of this community in a bay will have a significant effect on other communities in the bay, such a fishes, birds, and even terrestrial mammals which depend upon salt marshes for feeding. Wetlands are important habitats for many species during at least one stage in their life cycle. This is particularly true of Washington and Oregon because of the numerous large estuaries that occur in these states.

Proposal-related factors potentially affecting wetlands are oil spills and possible onshore construction. The activities associated with offshore drilling and platforms are not expected to cause impacts on estuaries and wetlands. General impacts on estuaries and wetlands are discussed further in Sections IV.B.9 and 10.a.(4)(g) for central and southern California. Impacts on fish, marine mammals, and endangered species of estuaries are discussed in Sections IV.B.7.a.(4)(d), (e), (f), and (g).

The larger estuaries in Washington and Oregon that would be of highest concern if an oil spill were to occur are 1) Columbia River estuary, 2) Coos Bay, 3) Willapu Bay, 4) Grays Harbor and 5) Puget Sound.

The concern for the ecological integrity of estuaries may preclude onshore development in them. Should a large oil spill occur and enter an estuary the impact would be very high if the oil covers a significant portion of the estuary and remains for several tidal cycles or low, for a spill covering a smaller portion of the estuary or one covering a significant portion of the estuary, but remaining for only a couple of tidal cycles. One oil spill greater than 1,000 barrels is assumed for this analysis. Thus, oil spill impacts to estuaries and wetlands would be limited to at most one area and recovery within one to three years is expected.

CONCLUSION: Estuaries and wetlands will experience low impacts.

CUMULATIVE IMPACTS: The total number of large 1,000 bbl or greater spills from all future, past and present oil activities is three. Impacts predicted from a spill and contact are discussed above. Two additional platforms are predicted to be required to develop existing resources, and if located off major estuaries having wide openings (e.g., Columbia River and Grays Harbor), a spill that might flow directly to any of the large estuaries would be difficult to contain or divert before entering the estuary. Given the three oil spills assumed in the cumulative impact assessment, there is a chance for oil spill impacts on one or more areas. Futhermore, the likelihood of an oil spill remaining in an sp for several tidal cycles increases, thus, the expected duration of impacts increases in the cumulative case and pesistance of impacts for three to six years might occur.

CUMULATIVE IMPACT CONCLUSION: Cumulative impacts are expected to be low.

(h) Impacts on Areas of Special Concern

There are no officially designated ecological reserves, marine lite retypes, or areas of special biological signficance in the Washington and

Oregon planning area. However, important habitat areas and sensitive species exist. Expected impacts to such areas and species are provided in the appropriate sections of Chapter IV.B.7.

(i) Impacts on National Marine Sanctuaries

There are no National Marine Sanctuaries off Washington and Oregon.

(5) Impact on Socioeconomic Environment

(a) Impacts on Employment and Demographic Conditions

Offshore support service and processing facilities onshore and offshore may result in changes in the employment, population and housing characteristics of the coastal region. The estimated change in employment expected to result from the proposal is based on the number of exploratory, delineation and development wells, platforms, storage and processing facilities, and onshore support service facilities in accordance with the proposal. Changes in the level of employment may result in an increase in population, which would lead to an increase in the demand for housing and public services and facilities. In general, the changes in employment and new resident population are expected to impact coastal communities in each planning area depending upon the location of OCS facilities and the place of residence of new workers.

Employment associated with the proposal is identified as direct, indirect, and induced. The changes in employment, income and population expected to result from the Proposal are measured against the base case projections of activity in each county in the coastal region in order to determine the level of impact.

Increases in population, employment and income as a result of the proposal are to peak in 2001, and permanent changes in population, employment and income are expected to be level from 2003 to the conclusion of production in 2028. Employment is expected to peak at 1,176 jobs and then decline to 124 jobs for the remainder of the project life. Five hundred seventy-one of the peak jobs or 60 of the permanent jobs are expected to be in the oil and gas industry. Population is expected to rise by 1,450 people in the year 2001 and level off at 153 new residents for the remainder of the project life. Personal income as a result of the proposal is expected to peak at approximately $18.7 million and to level off in 2003 at $2.0 million.

CONCLUSION: The overall impacts as a result of the proposal are considered to be very low.

CUMULATIVE IMPACTS: Cumulative impacts are expected to result in change in population, employment and income and are expected to peak in 1999, and permanent change in population, employment and income are expected to level from 2002 to the conclusion of production in 2023.

Employment is expected to peak at 3,312 jobs and then decline to 371 jobs for the remainder of the project life. One thousand six hundred and eight of the peak jobs or 180 of the permanent jobs are expected to be in the oil and gas industry. Population is expected to rise by 4,084 people in the year 1999 and level off at 765 new residents for the remainder of the project life. Personal income as a result of the proposal is expected to peak at approximately $52.7 million and to level off in 2002 at $5.9 million.

CUMULATIVE IMPACT CONCLUSION: The overall impacts are considered to be very low.

(b) Impacts on Land Use and Water Services

(i) Land Use

The coastal regions of Washington and Oregon do not have any current Pacific OCS oil and gas development. Hence, the region lacks a system of integrated onshore facilities and infrastructure to process and transport oil and gas.

However, it should be noted that north slope oil and gas development in Alaska has resulted in some oil and gas development and a variety of project proposals in this planning unit. The ports of Seattle and Portland possess refineries and marine terminals to process both Alaska and foreign oil, smaller coastal communities such as Ancortes, Grays Harbor, Coos Bay and Newport have constructed facilities or have proposals for the production of concrete islands and modular units to support Alaskan production.

Under the proposed action one platform is anticipated to be built by 1998, under this alternative, the oil extracted will be tankered to Seattle for processing. Gas extracted will be piped ashore. Existing facilities will be used to process oil and gas developed under the proposed action.

For purposes of analysis, land use impacts can be divided into four phases to correspond to the various activities needed to bring an oil and gas field into production: exploration, construction, production and decommissioning. During the exploratory phase a temporary support base (5-10 acres) would be needed. Nearly any harbor with industrially zoned land would be suitable. Potentially suitable harbors in Oregon include Coos Bay, Astoria and Newport. In Washington, Grays Harbor, Long View, and Port Angeles are potentially suitable. Due to the limited scope (one platform) and the temporary nature of the exploratory phase, land use impacts beyond the construction of a support base are expected to be very low.

The next phase, construction, will result in the greatest impacts to land use. Overall this phase will result in the construction of the platform itself, permanent associated support facilities, infrastructure, and temporary facilities to support actual construction. Oil which is extracted will be tankered to existing refineries in Seattle and will therefore not result in a land use impact. Facilities which can be expected to be constructed near Coos Bay would include a permanent service base (25 to 50 acres), a gas processing and treatment plant (50 to 75 acres), a pipeline from Coos Bay to intersect an existing pipeline from Roseburg to Portland (right of way 50-100 feet wide), pipeline installation and service base (5 acres), and pumping stations (40 acres each).

The land use which these anticipated facilities are expected to occupy is not currently developed. Therefore, as these facilities are constructed roads, sewers, water and electricity will also have to be provided. Population increase resulting from this proposal are not expected to have a land use impact. Because of an economic slump in the timber and fishing industry Coos Bay has been losing population. Therefore there should be available housing and community infrastructure available to absorb in migration. Region wide land use impacts will be very low, locally, however, land use impacts are expected to be moderate.

The production phase will only minimally affect land use and impacts will remain very low. The completion of construction activity will result in the closure of temporary facilities and the laying off of the work force used to support the construction program. This will have the effect of making developed land available for other uses. Population loss resulting from the laying off of the construction work force will increase the availability of existing housing thereby lessening the need to contruct new housing or additional community services.

Decommissioning will result in an increase in construction activity to dismantle the platform and to shut down any other facilities no longer needed. The effect on land use will be to make developed industrial land available for other industrial uses thus alleviating the need to develop new industrial land. Land use impacts will be very low.

CONCLUSION: Very low impacts will occur region wide and in Seattle area.

CUMULATIVE IMPACTS: The region is not currently tied into the offshore oil and gas industry infrastructure. This proposal will result in onshore industrial development being constructed which will tie Coos Bay into the national energy market via a gas pipeline. The additional two platforms should not result in any additional land use impacts as onshore facilities would be expected to be designed to handle anticipated production.

CUMULATIVE IMPACT CONCLUSION: The region should only experience very low land use impacts.

(ii) Water Services

OCS offshore development will create additional demand for water services. Water services consist of supplying fresh water for domestic, agricultural, and industrial purposes and then treating the water. OCS onshore generated demand can be expected to result in increased competition for this resource. Actual impacts to fresh water supplies and the capacity of sewage treatment facilities will be negligible if OCS demand does not exceed available capacities. Should OCS demand result in the potential overuse of water services, the degree of impact will depend on three factors. First, the ability of the OCS related development to contribute to developing additional fresh water supplies or waste water treatment facilities. Second, the ability of the local government to construct additional facilities. And third, the ability to tie in to other water service systems that possess surplus capacity.

The failure to address this issue can result in a variety of problems. Examples would include salt water intrusion into fresh water acquifers, water rationing, untreated sewage entering the ecosystem, building moratoriums, depletion of ground water supplies, and the loss of industry or agriculture that is dependent on water supplies.

Water services in Washington and Oregon will be called upon to support construction activities, the production of oil and gas, and population increases. Fresh water usage will certainly rise but the availability of fresh water is not expected to be a problem as fresh water supplies are. As previously mentioned in the land use section, water and sewer lines will have to be constructed to service the facilities built under the proposed action.

Sewage treatment facilities in large urban areas, such as Seattle would be adequate. In the smaller coastal communities, such as Coos Bay, existing treatment facilities may need to be modified or expanded to support OCS related development. Region wide, water service impacts are expected to be very low.

CONCLUSION: Overall, water services impacts will be very low.

CUMULATIVE IMPACTS: The water system infrastructure will be expanded and improved. The system will therefore have an expanded service area and will lessen the dependence of industry and residents on wells and septic systems. Improving the sewage treatment facility should reduce the potential for contaminating groundwater, rivers, and nearby ocean areas thereby improving water quality. It would be expected that new facilities constructed to support the initial platform would be designed to handle anticipated needs. Water service impacts would therefore be very low.

CUMULATIVE IMPACT CONCLUSION: Water service impacts would be very low.

(c) Impacts on Commercial Fisheries

(i) Commercial Fisheries

Indirect impacts would be those that directly affect fish or invertebrate populations or their availability such that their catchability by the fleet is altered. These indirect impacts are discussed in other sections of this statement. Direct impacts would be those where actual OCS oil and gas activities physically interfere with commercial fishing operations.

Direct impacts may be further classified as structural and operational. Structural impacts would include platforms and sub-sea units which could either snag or damage fishing gear or make an area unsuitable for fishing by their presence. Operational effects would be occasions of vessel traffic (construction, service and supply, tanker, and seismic) which would make fishing activities uneconomical, impractical, or dangerous. Another operational impact would be the loss of dock space for commercial fishing vessels to those associated with increased OCS activity.

The dungeness crab fishery has the potential to be affected to a very high degree because of its location in shallow water (less than 50 fathoms) where petroleum leasing activity tends to be concentrated. The concentrated use areas near Puget Sound, Gray's Harbor, Willapa Bay, the mouth of the Columbia River, and off central Oregon have the greatest potential for negative impacts. The nature of the fishery (set gear consisting of benthic "pot" traps connected by lines to surface floats, often 50 to 300 units per boat in a small area) also lends itself to vessel and gear interference form OCS activities. If these activities occur during the winter fisheries season (usually December through April) in areas of concentrated fishing, numerous float lines could be cut resulting in lost gear and catch. However, it is likely that OCS activity would be curtailed during crab season due to frequent rough weather and heavy seas. Even though impacts could be very high under extreme circum-stances they are expected to be very low because of the low expected level of OCS activities.

The pot fishery for sablefish, using gear similar to the crab fishery, could suffer similar impacts except that it occurs at depths too great for current oil production technology. Therefore impacts to this fishery are expected to be very low.

Impacts to troll fisheries for albacore and salmon are expected to be very low because the fishing techniques should not be much affected by OCS vessel movement or structural facilities. There is some danger if localized populations are adversely affected by OCS activities but this is also expected to be very low (see Fish Resources section).

The rockfish fisheries off of Oregon and Washington are mainly a hook-and-line ("gang") operation though some are captured by drag boats (trawlers). Impacts to these fisheries could come through impacts to the target resource (egg and larval sensitivity to seismic pulses generated during exploration is a concern) or its catchability (dispersal of feeding assemblages by seismic operations is also of concern here). Increased vessel traffic in fishing grounds could interfere with trawl routes or damage hook gangs. Because of the low projected level of OCS activity in this area associated with this plan and the large size and coastwide distribution of rockfishes, overall impacts are expected to be very low.

Impacts to fisheries for flatfishes (including Pacific halibut and rex, Dover, petrale, and English soles) are anticipated to come from the placement of structures and facilities in tradional fishing grounds, vessel traffic interference with contour-following trawl routes, or damage to long-line set gear. However, due to the projected low level of OCS activity associated with this proposed plan, the location of fishing areas in respect to potential petroleum resources and the distribution and abundance of these species, the expected impacts are rated very low.

CONCLUSION: The net planning area wide impact to commercial fisheries as a result of implementation of the proposed action is expected to be very low.

CUMULATIVE IMPACTS: Over the long term, OCS activities could lead to more offshore structures and a substantial increase in OCS related vessel traffic. The increased oil spill risk associated with this scenario has the potential to damage fisheries (see Fish Resources section) and subsequently commercial marine fisheries for the affected species. Those most likely to incur an increase in negative effects are the troll fishery for salmon (because of its sensitive life history), the Pacific herring fishery (because of its surface nature), and the rockfish and crab fisheries (because of the planktonic nature of the eggs and larvae).

Increased vessel traffic could further interfere with fishing operations and gear, and further increase competition for harbor facilities and services. Although all fisheries would be affected, the greatest effects would be felt by trawl fisheries (shrimp and groundfish mostly) and set gear fisheries (crab, lobster, sablefish, halibut, and others.

The greatest overall impact is liable to be incurred by the crab and lobster fisheries, with levels potentially being high or very high. Trawl fisheries could suffer medium losses. As in the base case though, the anticipated overall low level of OCS activities is expected to keep commercial fisheries impacts reduced.

CUMULATIVE IMPACT CONCLUSION: Commercial marine fisheries off of Washington and Oregon should incur only low cumulative impacts.

(ii) Recreational Fisheries

As with commercial fisheries, impacts to larger species will affect sport fisheries. Increased OCS vessel traffic will not have as big an impact recreational fishermen as on commercial ones because of better vessel mobility and the lack of use of set gear. The projected platform might attract target species which could increase catches.

CONCLUSION: If the proposal causes any impact at all to sport fisheries it likely will be very low.

CUMULATIVE IMPACT DISCUSSION: Negative impacts to target species (see Fish Resources section) would result in reduced angler catches. Some OCS activities might preclude or inhibit the use of certain areas by commercial passenger fishing vessels (CPFVs). Structures (platforms, sub-sea connections, pipelines) which attract target species would result in increased angler catches, but might also result in increased loss of terminal gear through fouling. Significant increases in angler catch of certain species, in the short-term, may have negative impacts on overall population levels (and hence angler catches) in the long-term. Other aspects of recreational fishing are discussed in the Recreation and Economics sections of this document.

CUMULATIVE IMPACT CONCLUSION: The net, planning area wide, impacts to recreational fishing is expected to very low.

(d) Impacts on Recreation and Tourism

Oil spills, offshore structures, and pipelines can potentially affect recreational resources. It is important to note that use of recreational areas fluctuates dramatically with weather conditions; however, the trend is for a growth in use over time due mainly to population increases, and increases in discretionary time and money. It is also important to note that an impact on any of the recreational resources would affect the local economic conditions, and could affect the other recreational resources in the area by both translocation of the recreationists, and by making the resources less desirable.

Oil spills will affect recreational resources at locations which are contacted by oil spills, or which are near to those points of contact. Recreational resources of concern in the planning area are primarily water related, however, due to the climatic conditions and accessability, the visitor use is far lower than that of southern California. If an oil spill were to occur and contact a stretch of coast, a moderate impact could occur locally. However, if the spill did not contact the shoreline a very low impact would occur both locally or over the planning area. As a result of this proposal, it is estimated for the Washington and Oregon planning area that one oil spill greater than 1,000 barrels will occur. Oil spills are expected to have a very low impact on recreation and tourism as a result of the proposal. Additionally, no impact is expected to visual resources in the region from oil spills.

The level of impact to recreational resources caused by an offshore platform is mainly visual and depends upon the distance offshore the platform is located and the recreational resources that are on the stretch of coast adjacent to the platform's site. The farther offshore a platform is located the lower the level of impact that will occur to the onshore resources. The proposal is expected to result in the installation of one platform. It is not known where the platform will be located, but it is assumed to be located off Coos Bay.

This platform is expected to have a very low impact on recreation and tourism with a localized low impact to tourism. Visual resources will suffer a very low impact over the planning area, and a low impact at the local level. However, at the local level, certain stretches of coast could experience a moderate impact or a high impact if the platform is located in the first tier of tracts.

Pipeline installation can cause a short term disruption of recreational resources at the landfall during installation, but after the installation is complete; the only impact will be visual. This impact will be a localized low impact to the visual resources along the onshore pipeline right of way.

CONCLUSION: The expected impacts to recreation, tourism, and visual resources as a result of the proposal are very low.

CUMULATIVE IMPACTS: Impacts to recreation and tourism, and their allied resources, are expected to occur from other projects described in section IV. B.7.a., which may occur in the region. However, since State and local jurisdictions have primary authority over onshore development, it is assumed that their requirements will hold the impact level to low.

As a result of future OCS proposals, there is a 92 percent probability that one or more oil spills greater than 1,000 barrels will occur.

A containment and diversion of oil spills will occur as soon as an oil spill happens, any spill that does occur is not expected to directly contact recreation areas, and thus a very low impact is expected to recreational resources.

In addition it is estimated that three platforms could be installed. It is not known where the platforms would be installed but it is assumed that one could be off Coos Bay, one off Astoria, and one off Grays Harbor. These are expected to have a very low imapct over the planning area, and a low impact on the local recreational resources, but could have no impact if far enough offshore, or could have a high impact if placed close to the threemile line.

CUMULATIVE IMPACT CONCLUSION: Impacts are expected to be low.

(e) Impacts on Archaeological Resources

The archaeological resources subject to impact from offshore oil and gas development included prehistoric and historic sites. There are no known and recorded submerged prehistoric sites, but numerous coastal eroding sites and coastal shell mounds are known.

The possibility of the existence of submerged prehistoric sites is suspected but high wave energies during transgression/regression episodes (sea level changes) may have destroyed any sites. Only sites in low energy areas such as lagoons and estuaries, and at low energy beaches, are likely to have survived (MMS, 1982a). The difficulty in determining where sites might exist is in interpreting the geologic record of low energy areas back through the last 40,000 years.

Historic sites include both onshore National Register sites such as lighthouses, and sites offshore most of which are shipwrecks.

The main impacting agents to cultural resources are bottom disturbing activities, oil spills, onshore facilities, and the visual intrusion of offshore structures.

Bottom disturbing activities can include any activity utilizing anchors for stabilization; pipeline laying activities such as trenching, use of lay or pull barges; well drilling activities either during the exploration phase or during the development and production phase; and platform construction and anchoring. Additionally, the placement of metal objects on the ocean floor (for example, pipelines, subsea completions, or lost equipment) may cover up the magnetic signature of historic resources during a magnetometer survey. Failure to identify a resource during the survey phase may lead to its inadvertent destruction during construction or exploration.

Offshore oil and gas activities sometimes result in an accidental release of oil. Oil spills can impact archaeological resources in several ways. These include degrading the viewshed of any historic, prehistoric, religious or ceremonial site, direct oiling of sites and/or resources, and inadvertent destruction of sites during clean-up.

All onshore surface-disturbing actions have the potential to destroy or disturb terrestrial prehistoric and historic sites. Activities with this potential include, but are not limited to, pipelaying activities, construction or expansion of support and processing facilities, and construction of temporary facilities for short-term projects.

Since State and local jurisdictions have primary authority over onshore development, it is assumed that their requirements for cultural resource protection will significantly reduce the likelihood of sites being disturbed or destroyed. There is always the possibility of undetected sites being destroyed during the construction process.

It is not known where the one hypothetical platform will be installed, but for this analysis it is assumed to be off Coos Bay. The platform and the associated bottom disturbing activities are not expected to contact any archaeological resources.

As result of the proposal, it is estimated that one oil spill greater than 1,000 barrels will occur in the Washington and Oregon planning area. As oil spills have a potential to damage archaeological resources by direct oiling, by degrading the viewshed, and by inadvertently damaging resource during clean up operations, a very low impact is expected to archaeological resources as a result of the proposal.

CONCLUSION: Very low impacts to archaeological resources are expected from the proposal.

CUMULATIVE IMPACTS: Impacts to archaeological resources over the region will occur both offshore and onshore as a result of the other projects which are described in IV.B.7.a. This is expected to result in a low impact over the planning area.

As a result of future OCS proposals it is estimated that three platforms will be installed. It is not known where the three platforms will be installed, but it is assumed that one could be off Coos Bay, one off Astoria, and one off Grays Harbor.

These platforms and the associated bottom disturbing activities are not expected to contact any archaeological resource. As oil spills have a potential to damage archaeological resources by direct oiling, by degrading the viewshed, and by inadvertently damaging resource during clean up operations this is expected to have a very low impact on archaeological resources.

CUMULATIVE IMPACT CONCLUSION: The future proposals do not significantly add to the cumulative impacts, and the impact level is expected to remain low.

(f) Impacts on Marine Vessel Traffic

The impacting agents that are associated with the proposal that may affect marine traffic are: 1) additional vessel traffic (i.e. tankers, crew and supply boats, and geophysical survey vessels), and 2) offshore structures (exploratory rigs, platforms, and subsea completion systems). The potential impacts that could occur as a result of these impacting agents are discussed below:

Marine vessel traffic refers to large commercial vessels which travel in Washington, Oregon, and California offshore waters. This traffic is bound to or from ports in California, Oregon, Washington, British Columbia, Alaska, the Gulf of Mexico, Japan, China, Singapore or other foreign ports. This traffic is composed of large vessels including tankers, container ships, freighters, dry bulk carriers, auto carriers, lumber ships, and passenger ships.

Marine Vessel Traffic. Additional vessel traffic such as tankers, crew and supply boats, subsea completion drilling vessels, and geophysical survey vessels are expected to be used as a result of the implementation of the Proposal. When these vessels use or traverse traffic lanes and areas used by commercial vessel traffic which coincide with proposed leasing areas, potential conflicts could occur. These conflicts include collisions and vessel rerouting. Also, subsea completion drilling vessels may stay on-site for prolonged periods of time. Further conflicts arise when vessels do not adhere to designated traffic lanes. At this time, no temporary or permanent structures exist in the traffic lanes, precautionary areas or safety fairways in any of the planning areas.

Platform removal activities would involve the short-term use (less than 4 weeks) of crew and supply boats at the platform site. These activities are not likely to result in impacts that are significantly different from those discussed in this section.

Proposal-associated collisions could result in a loss of human lives, personal injuries, property damage, and large oil spills.

Offshore Structures. Exploratory drill ships, platforms, and subsea completions are expected to be used as a result of the implementation of the Proposal. Structures such as platforms could pose either a positive or negative impact to marine traffic. In a study conducted by the Transportation Systems Center, it was determined that 78 percent of all tanker vessel casualties in U.S. waters involving rammings, collisions, and groundings took place at night or during periods of reduced visibility (U.S. Dept. of Commerce, 1981a). While reduced visibility has the potential of increasing the number of collisions between vessels and offshore structures, platforms could also provide a benefit for safe navigation due to navigational aids that are mandated by the U.S. Coast Guard. The vessel traffic lanes have been extended in southern California as a result of the installation of oil platforms in the Santa Maria Basin, as they provide additional navigational aids (lights, horns, radar, etc.).

The U.S. Dept. of Commerce (1981a) conducted a computer simulated study of vessel movements around offshore structures in the Santa Barbara Channel. When structures were placed (simulation) near the border of a traffic lane, vessel operators often performed evasive actions which increased the risk of collision with other vessels. The risk was increased when structures were located on opposite sides of the traffic lane so as to form a "gated" configuration. The occurrence of such evasive maneuvers was considerably decreased by the placement of structures outside the Coast Guard-designated 500 meter buffer zone, as well as when no permanent or temporary structures were placed within 1,000 meters of the boundary of the traffic lane for two miles either side opposite of the structure bordering the lane (U.S. Dept. of Commerce, 1981a).

A very small increase in marine vessel traffic (i.e., tankering, crew and supply boats, seismic exploration vessels) is expected to occur offshore Washington/ Oregon as a result of this proposal. This very small increase in traffic would be due to supporting the level of activity anticipated in this planning area - one platform, ten exploration wells and 29 production wells. Although there are no official Coast Guard established shipping lanes, any increase in vessel traffic potentially increases the risk of vessel accidents (between vessels or between platform and vessel). These accidents could result in the loss of human life, personal injuries, property damage, and oil spills. Additional conflicts could also arise in the form of increased port congestion and competition for port facilities such as docking berths. These potential problems are expected to be minimal, however, due to the very low level of activity anticipated in this planning area (one platform), from the proposal, and the continued enforcement of Coast Guard navigational safety requirements.

Oil spills, regardless of source (vessel collisions, platform blowouts, etc.) may impact vessel traffic. The impacts would be due to rerouting of traffic to avoid the area of contamination in order to both avoid direct contact with any spilled oil and to not interfere with cleanup operations. The risk of such impacts is considered insignificant because of the very low oil spill risk (8 percent probability of one or more spills greater than or equal to 1,000 bbl) from the proposal in this planning area. Installation of offshore platforms could also represent a benefit to navigation through lighting, fog horns, radar, and other navigational aids.

CONCLUSION: Very low impacts are expected from the proposal to marine vessel traffic.

CUMULATIVE IMPACTS: It is anticipated that three platforms, 33 exploration wells, and 90 development wells will result from all OCS operations into the future. The impacts associated with this level of activity are considered very low as the increase in overall marine traffic would be minimal, thereby increasing the risk of vessel conflicts and accidents a very small amount. Vessel traffic can be rerouted with minimal disruption (such as time delays) in the event an oil spill does occur. Note that the risk of oil spills from import tankers (Alaskan and Foreign) is much greater than from operations in the planning areas.

CUMULATIVE IMPACT CONCLUSION: Very low impacts are expected from the cumulative level of development to vessel traffic.

(g) Impacts on Military Uses

Most of the current military operations require "exclusive-use" areas with large safety zones or "joint-use" areas with many precautions and extensive scheduling, for hazardous and critical operations.

The placement of permanent and semi-permanent structures on the OCS is a significant part of oil and gas activities. This would eliminate that part of the OCS from military operations for up to the expected life of the proposal (25 years), forcing the curtailment or shifting of current military operating areas. If alterations were not made, the risk of a life-threatening accident would be greatly increased. The impacts to military activities could be high as a result of the placement of offshore structures, if the structures are placed in areas used by the military.

As oil and gas activities are opened up in Washington and Oregon, additional space-use conflicts will be created with the military.

As a result of this proposal it is estimated that one platform will be installed, and one oil spill could occur in the Washington/Oregon planning area.

It is not known where the platform will be installed, but it is assumed to be off Coos Bay. As most of the military activity occurs at the extreme north end of the planning area off Washington, a very low impact (the level and location of offshore oil and gas activity will require only minor modification of occasional NASA/DOD activities) is anticipated for the installation of the platform.

CONCLUSION: Overall impacts to military operations in the planning area would be very low, as a result of OCS development.

CUMULATIVE IMPACTS: The cumulative impacts to military uses are not expected to be significant due to the limited area of military use off Oregon and Washington.

As a result of future OCS proposals it is estimated that three platforms will be installed, and 3 oil spills could occur in the planning area. It is not known where the platforms will be installed but it is assumed that one will be off Coos Bay, one off Astoria, and one off Grays Harbor. As most of the military activities do not occur near the assumed platform sites, a very low impact is anticipated from the installation of the platforms.

CUMULATIVE IMPACT CONCLUSION: Impacts from the OCS-related activities and displaced fishing conflicts are expected to cause a low level impacts.

(h) Impacts on Native Subsistence

The intertidal Washington and Oregon areas are used extensively for gathering purposes by various groups of people. With the increased awareness of their cultural and spiritual past, the Native Americans have an increased desire to collect, for ceremonial purposes, marine species that live in inter-tidal areas. In addition, there is an unknown number of Native Americans and other ethnic groups using the intertidal areas for subsistence gathering.

The major impacting agent to the resource of concern is an oil spill coming ashore at an intertidal gathering area, which would tend to foul and render the area unusable as a gathering site for a period of time. (The impacts to the intertidal areas are given in Section IV.B.7.a.(4)(b).)

As a result of this proposal, it is estimated that one oil spill greater than 1,000 barrels could occur in the Washington and Oregon planning area. As oil spills have a potential to damage native subsistence sources primarily by direct oiling and by destroying the intertidal resources during clean-up operations, a very low impact is expected to native subsistence over the planning area, with potential localized moderate impacts at any location the spill contacts.

CONCLUSION: The expected impacts to native subsistence as a result of the proposal are low.

CUMULATIVE IMPACTS: Impacts to Native subsistence will occur from onshore projects, which are described in IV.B.7.a. and these are anticipated to have a moderate impact.

It is estimated that three oil spills could occur in the Washington and Oregon planning area as a result of cumulative sources.

As oil spills have a potential to damage native subsistence sources primarily by direct oiling and by destroying the intertidal resources during clean-up operations, a low impact is expected to native subsistence over the planning area, with potential localized moderate impacts at any location the spill contacts.

CUMULATIVE IMPACT CONCLUSION: cumulative impacts to notice subsistence will be moderate.

b. Unavoidable Adverse Impacts

Oil spills, discharges of drilling muds and cuttings, formation water discharge, and sewage disposal will all cause unavoidable adverse impacts on water quality under the proposal.

OCS development will increase the demand for water services. Unavoidable adverse impacts will occur in areas where demand exceeds supply. Types of impacts that may be experienced are: rationing, growth moratoriums, displacement of some non OCS activities, and/or the construction of new facilities to meet demand.

Unavoidable adverse impacts to ports and navigation could occur in the expected cases of oil spills. Traffic reduction into and out of ports and rerouting through areas could be required.

OCS development will increase the demand for land. Land currently used for industrial uses or zoned for such uses will not experience an unavoidable adverse impact. Unavoidable adverse impacts will occur when OCS uses converts land to that use or when it displaces non OCS activity. OCS development will preclude the use of these affected land from other uses during the duration of OCS activity.

There will be some unavoidable losses of submerged and terrestrial cultural resources. Losses are felt to be unavoidable due to the difficulty of detecting submerged and buried terrestrial reousrce sites.

Coastal benthic ecosystems would be unavoidably adversely affected from the proposal due to oil spills and various descharges mentioned above for water quality. The level of impact is restricted geographically and temporarily.

The proposal could have unavoidable adverse impacts to fish resources as a result of oil spills, seismic operations, platform siting, and drilling discharges. Oil spill impacts would occur mainly to surface fish, those with planktonic larvae, and intertidal residents. Seismic operations impacts, if they occur, would primarily affect species with planktonic larvae. Platform siting impacts would be incurred by benthic species, especially flatfishes, and benthic invertebrates. Impacts from drilling discharges also would be concentrated on less motile benthic species.

Commercial and recreational fishing could suffer unavoidable adverse impacts directly from oil spills, seismic operations, increased vessel traffic platform siting and inderectly from any action that negatively impacts target species (see above). Oil spills could foul boats and gear, making them unusable, or could preclude fishing in afected areas. Towed seismic arrrays could also foul gear. Increased OCS-related vessel traffic could hinder fishing operations,result in an at-sea collision which could disable fishing vessels, or compete for berthing space in ports and harbor Platform location could interfere with travel routes.

Unavoidable adverse impacts could occur to marine mammals and coastal and marine birds due to accidental oil spills. Threatened and endangered species could be more significantly impacted due to their already stressed population levels. Noise from OCS activities are likely to cause minor adverse impacts to cetaceans.

Air quality in the immediate vicinity of an OCS oil and/or gas activity will be unavoidably affected. Emissions from internal combustion engines, turbines, leaky valves, etc., will degrade air quality near drill ships, platforms, pipelaying barges, refineries, and gas processing facilities.

Unavoidable adverse impacts to recreation could occur through beach closure if a spill hit shore during a tourist season. Oil spills could temporarily close marinas and boat launching facilities adversely affecting sportfishing, and boating.

Visual resources will suffer unavoidable adverse impacts due to platform contruction on the OCS. Scenic areas will be visually degraded but the extent of degradation is dependent upon the placement of platforms. Visual adverse impacts will last the lifetime of the projected OCS oil and gas activities.

c. Relationship Between Short-Term Uses of Man's Environment and Long-Term Productivity

The proposal is expected to have a 30-year lifetime at minimum. Activities which precede the proposal, have a lifetime exceeding the termination of oil and gas activities, and which affect long-term productivity locally and regionally are water supply, recreation, land use, coastal ecosystems, commercial fisheries, and endangered and threatened species.

OCS development will increase the demand for water services. In areas where demand exceedes supply, OCS development could result in short-term scarcities, Long-Term productivity may be limited if the capacity of the water service systems can not be expanded to meet demmand.

Recreation will suffer short-term impacts due to the potential removal of coastal locations from recreational use for the duration of the project. There may be a delay in return to normal recreational use after the project. Marine vessels associated with OCS activities may continually conflict with recreational and commercial fishing boats for berthing space, use of port and harbor facilities, and operating areas. These conflicts would cease, if and when, OCS activities come to a final halt.

Coastal ecosystems are likely to suffer short-term impacts to productivity during various phases of OCS activity. These impacts could translate into long-term impacts on fisheries production and productivity of sensitive marine habitats. With the cessation of oil and gas activities, the marine environment is generally expected to return to previous levels.

The long-term effects of platforms and other OCS-related structures on commercial fisheries is not known, however no long-term adverse impacts on sports fisheries are expected. Platforms left in place after production stops could continue to function as either an artificial reef or an impediment to commercial fishing, especially traveling.

OCS development will increase the demand for land. Short-term impacts to the human environment would include construction activity to develop land to support OCS development, the possible displacement of non OCS related development, and induced land use impacts resulting from OCS related population increases, Long-Term producitivity of the land will not be affected. Open space, residential, industrial, or commercial land uses, are all productive land uses.

Coastal ecosystems are likely to suffer short-term impacts to productivity during various phases of OCS activity. These impacts could translate into long-term impacts on fisheries production and long-term impacts on productivity of sensitive marine habitats such as estuaries and shallow offshore reefareas. With the cessation of oil and gas activities, the marine environment is generally expected to return to its normal long-term productivity levels.

d. Irreversible and Irretrievable Commitment of Resources

The proposal to lease in Planning Area does not by itself result in the irreversible and irretrievable commitment of any resources. However, if oil and gas resources are explored, found and developed, the proposal is expected to result in the eventual irreversible and irretrievable commitment of 58 million barrels of oil and 1043 billion cubic feet of gas since, once these resources are produced and used, they will not be available for use at a future time.

Cultural resources in the Oregon/Washington OCS is another resource that may suffer irreversible commitments of the resource if the proposal is adopted. Destruction or disturbance of a cultural resource site either by construction or by scientific exploration is permanent. The value of a site is lost to a very large extent if disturbed even if relics are subsequently recovered.

Rare species inhabiting benthic marine ecosystems may be damaged irreversibly from activities on the OCS associated with this proposal. The nature of potential resource change (irreversible or not) is unknown for the vast majority of the OCS.

Migrating cetaceans, especially gray whales, may suffer irreversible impacts if the acceleration of OCS activities within its range causes or contributes to a shift away from current migration routes to less favorable migratory passages.

e. Impacts of a High Case Scenario

This section provides a discussion of the potential environmental impacts that could occur in the unlikely event that all unleased, undiscovered, economically recoverable hydrocarbon resources in the Washington and Oregon planning area are leased and developed as a result of the proposal.

It is important to point out that Washington and Oregon does not have existing offshore oil and gas development. The High Case assumes that the resources will be developed as a result of lease sales from this 5 year program.

The estimated "High Case" hydrocarbon resources for the Washington and Oregon planning area are as follows: 180 million barrels of oil and 3,260 billion cubic feet of gas. These estimates are identical to the resource estimated used in the cumulative case. Infrastructure expected to be used to explore and develop these resources includes 33 exploration and delineation wells, 90 development wells, and 3 platforms. The infrastructure for the high case is identical to that used in the analysis of cumulative impacts. However, the estimated number of oil spills greater than 1,000 barrels remains at one the same as the base case proposal. Thus, the number of expected oil spills in the high case is significantly different than in the cumulative case (one spill in high case and three spills in the cumulative case).

Because the high case and cumulative case have virtually identical scenarios concerning potential impact causing agents, the expected impacts of the high case are likewise virtually identical to the expected impacts of the cumulative case. The difference in the assumed number of oil spills is the impacting agent that generates the potential for different impacts under the high case scenario than under the cumulative case scenario. The high case analysis assumes only one oil spill while the cumulative case assumes three oil spills greater than 1,000 barrels. Two more oil spills in the cumulative case, which are associated with tanker shipment of Alaskan North slope and imported oil increases the expected impact levels for three resource categories: Threatened and Endangered Species; estuaries and wetlands; and native susbsistance. All three of these resource categories have moderate expected impacts in the cumulative case and either low or very low (native subsistance) expected impacts under the base case scenario. The expected impacts of the high case should be the same as those for base case for these three groups of resources because the number of oil spills assumed in the base and high cases are identical (one).

Threatened and endangered species: Impacts are expected to remain in the low to moderate range. Impacts resulting from increased normal activities are not expected to affect impact levels. Species which are more sensitive or numerous would be more vulnerable to the effects of an oil spill than outlined in alternative 1 due to the increased likely hood of an oil spill.

Estuaries and wetlands: Normal production will not affect estuaries and wetlands. A large oil spill entering an estuary or wetland will have a very high impact.

Native subsistence: Impacts would remain the same as alternative 1.

Impacts on water quality, on a regional basis, total development will have a low impact on water quality (Same degree of impact as alternative 1). However, the increased number of wells and the continued persistence of low level of contaminates would result in moderate to high impact on water quality adjacent to each platform. An estimated 554,000 bbls of muds and cuttings, and 135 million bbls of produced waters would be discharged in the ocean from three platforms.

f. Alternative II - Subarea Deferrals

Selection of Alternative II would result in the deferral of all blocks in the Washington and Oregon planning area seaward of the area of hydrocarbon potential. (See Figures II.A.2.a-7 and II.A.2.a-8).

The deferral of this subarea would have no noticeable effect on the potential impact resulting from oil and gas development off Washington and Oregon because the area deferred has no known hydrocarbon potential. Impacts are the same as described in Alternative I.

g. Impacts of Alternative III - Add a sale in the Straits of Florida

Adding a sale in the straits of Florida will not effect this planning area. However, under Alternative III all sales proposed under Alternative I - the proposal, would be held. Therefore, the expected impacts of Alternative III are identical to Alternative I for this planning areas.

h. Impacts of Alternative IV - Biennial leasing

This alternative schedules biennial sales in those planning areas which have triennial sales in Alternative I. Since, under Alternative I, the Washington, Oregon planning area is scheduled to have only 1 frontier exploration sale, this planning area would also have only 1 sale under Alternative IV.

Therefore, estimated hydrocarbon resources for Alternative IV in the Washington and Oregon planning area remain the same as for Alternative I: 58 million barrels of oil and 1,043 billion cubic feet of gas. Infrastructure expected to be used to explore and develop these resources includes 10 exploration and delineation wells, 29 development wells, and 1 platform, remain the same as well.

The number of oil spills and the probability of one or more spills over 1,000 barrels is not expected to change for the planning area. Therefore, impacts for alternative IV are expected to remain the same as Alternative I.

i. Impacts of Alternative V - Acceleration Provision

This alternative assumes the implementation of the acceleration provision in those planning areas which have a triennial pace of leasing in Alternative I. Since the Washington - Oregon planning area does not have triennial leasing under Alternative I, the one lease sale (1991) for the Washington and Oregon planning area identified in Alternative I will remain the same for this alternative.

Estimated hydrocarbon resources for Alternative V in the Washington and Oregon planning area remain the same as for Alternative I: 58 million barrels of oil and 1043 billion cubic feet of gas. Infrastructure expected to be used to explore and develop these resources includes 10 exploration and delineation wells, 29 development wells, and 1 platform remain the same as well.

The number of oil spills remains the same as the proposal, and the probability of one or more spills over 1,000 barrels is not expected to change for the planning area. Therefore, impacts for Alternative V are expected to remain the same as Alternative I.

j. Impacts of Alternative VI - Defer Leasing in Six Planning Areas: North Atlantic, Washington and Oregon, Northern California, Central California, Southern California, and North Aleutian Basin

Selection of Alternative VI would defer leasing in all planning areas of the Pacific Outer Continental Shelf during this 5-year program. The impacts resulting from this alternative would be the same as described for Alternative VII (No action) for the Washington and Oregon planning area.

k. Impacts of Alternative VII - No Action

Under this alternative, the Secretary of the Interior would propose not to schedule any oil and gas lease sales for this proposed 5 year program. All potential impacts to the physical, biological, and socioeconomic environment resulting from hydrocarbon exploration, development, and production would be eliminated.

Oil and gas are currently the nation's primary energy source. Even with a vigorous conservation program the United States demand for energy will continue to grow. With the adoption of Alternative VII the oil and gas that would have been available as a result of this proposed program would no longer contribute to the national domestic production during the life of the program.

With the removal of the potential oil and gas into the national energy reserves, it would necessitate the increased production of energy from other conventional and non-conventional energy sources (See Appendix C), and/or increases in import levels from foreign sources. See Section II.A.7. for a summary of impacts from alternative energy sources.

Alternative VII would eliminate the contribution, from the Washington and Oregon planning area, of 58 million barrels of oil and 1,043 BCF of gas to the domestic energy production. The energy potential of this quantity of oil and gas would have to be replaced by alternative energy sources.

Impacts resulting from the exploration, development, and production of these resources would be eliminated.

Many of the changes to the environment will be the result of other projects which are planned for or are currently existing in the planning area. Several of these are listed in Section IV.B.7.a.(1).

8. Northern California

a. Alternative 1

The proposal includes holding two sales in the Northern California planning area. It is estimated that the sales will produce about 231 million barrels of oil and 1,023 billion cubic feet of gas over a 35 year period. Approximately 20 exploration wells will be drilled. These resources will be produced from 48 production wells from two platforms. In addition to the oil and gas, about 173.2 m bbls of formation water will be produced. Approximately 306,000 bbls of muds and cuttings could be discharged into the sea over the life of the proposal. It is anticipated that two new support bases would be required.

(1) Interrelationship of Proposal with Other Projects and Proposals

(a) National Parks and Sanctuaries

There are no National Parks and Sancturaries within the Northern California Planning Area.

(b) Oil and Gas Sanctuaries

The California Oil and Gas Sanctuaries are specifically excluded from oil and gas leasing by Chapter 1724 of the Statutes of 1955, the Cunningham-Shell under State law Tideland Act. The Oil and Gas Sanctuaries are administered by the State Lands Commission. There is no restriction on the placement of pipelines through the sanctuaries as a result of OCS activities.

The State of California has designated the following areas as oil and gas sanctuaries located adjacent to the Northern California Planning Area (PRC 6871.2(f) and (e)):

a) All those tide and submerged lands being in the Counties of Humboldt and Mendocino...

b) Until January 1, 1995, all those tide or submerged lands situated in... Del Norte County...

(c) Coastal Zone Management

The California coastal plan was completed in December of 1975. This plan grew out of the 1972 Coastal Initiative (Proposition 20) which was adopted by the people of California. Within the State of California coastal zone planning is divided into two segments: the segment for the San Francisco Bay area is under the Bay Conservation and Development Commission (BCDC); the remaining coastal areas are under the California Coastal Commission.

Federal approval of the San Francisco Bay segment occurred in 1977; in 1978, the statewide segment was approved. The BCDC was created under the McAteer-Petris Act of 1965, as amended. Its jurisdiction extends inland generally 100 feet from marshes and tidal surfaces of the Bay. Proposed developments involving placement of fill, dredging, or substantial changes in the use of the shoreline require a BCDC permit. The BCDC's permit program is based on the San Francisco Bay Plan which addresses, among other things, infrastructure support needs for OCS activities, provision of public access to and along the shoreline, park development, waterfront redevelopment, and marsh protection. The Plan incorporates various special area plans prepared and adopted by local governments as amendments to their general plans.

The CCC was created under the California Coastal Act of 1976, as amended. The jurisdiction of the Commission extends inland generally to the first ridgeline of the coastal mountains and up to five miles from the shorelines where significant resources are involved. The Commission is designated by the California Coastal Act and the Governor as the lead agency for implementing the Federally approved CZMP and is, therefore, responsible for all activities relating to Federal consistency. In the San Francisco Bay area, decisions relating to Federal consistency are made by the BCDC through coordinated review and concurrence procedures with the Coastal Commission.

The policies of the California Coastal Act address the following areas of concern: public access, recreation, marine environment, land resources, residential development, energy facilities siting, and industrial development. In general, consolidation of energy and industrial facilities is encouraged by the State, except in situations where it is beneficial to choose new areas for such uses. The Act requires that the primary vehicle for implementing the CZMP be the local coastal program (LCP) to be prepared by each of the 67 local governments laying wholly or partially within the coastal zone. Each LCP is comprised of two parts: all land use planning and zoning, or other necessary ordinances to implement that plan. Before approval of a LCP for a particular local jurisdiction, the CCC issues coastal development permits for that area. After the LCP is approved and certified, this permit authority is delegated to the local government with provisions for appeal of local permit decisions to the CCC, which may affirm or override the local decisions.

The LCPs are required to address such issues of Statewide concern as identifying and establishing policies for areas of sensitive or significant ecological habitats, wetlands, commercial/recreational boating, and other coastal uses. The LCP supercedes the local government's general plan in coastal-related uses, which are determined in accordance with State guidelines and criteria. In contrast, local general plans address primarily issues of concern only to the local government.

(d) Ocean Dumping

Off the coast of Northern California are a variety of material disposal sites (see Table IV.B.8.a.(1)(d)-1). For a discussion on the various types of ocean dump sites see Section IV.B.7.a.(1)(b).

TABLE IV.B.8.a.(1)(d)-1

NORTHERN CALIFORNIA DESIGNATED DUMP SITES

Location		Depth	Content or Designated Waste
4144'N 12428'W	Cresent City	200 M	Dredge Spoil
4144'N 12412'W	Cresent City	30 M	Dredge Spoil
4050'N 12425'W	Humboldt Bay	200 M	Dredge Spoil
4046'N 12416'W	Humboldt Bay	70 Ft	Dredge Spoil
4046'N 12416'W	Humboldt Bay	70 Ft	Dredge Spoil
4007'N 13524'W	Off Cape Mendocino	2180 M	Low Level Radioactive Waste
3933'N 12546'W		3900 M	Explosives & Toxic chemical ammuition Chase V
3926'N 12358'W	Fort Bragg	200 M	Dredge Spoil
3926'N 12350'W	Noyo River		Dredge Spoil
3926'N 12350'W	Noyo River	64 M	Dredge Spoil
3925'N 12350'W	Noyo River		Dredge Spoil
3930'N 12540'W			Low Level Radioactive Waste (not used)

(e) Memorandum of Agreement Between the Department of Defense and the Department of the Interior on Mutual Concerns on the Outer Continental Shelf

On July 20, 1983, the Secretary of Defense and the Secretary of the Interior agreed to establish procedures for joint use of the Outer Continental Shelf. For a more detailed discussion on the Memorandum of Agreement see Section IV.B.10.a.(1)(e). Also see Section III.C.10.c.(7) for a discussion of military use areas.

(2) Projects Considered in Cumulative Impact Assessment

(a) Oil and Gas Activities

On May 14, 1963, the first Federal OCS oil and gas lease sale on the Pacific Coast was held. Of the 59 blocks in the Eureka area, 16 blocks opposite Arcata and Humboldt Bays were deleted from the offering to avoid conflicts with shipping and the Department of the Defense. Within the Northern California planning area, 17 blocks were leased in the Eureka area and ten blocks in the Point Arena area. In the offshore Eel River basin four exploratory test wells were drilled during the one-year period from July 12, 1964 to July 11, 1965. Three wells were drilled in the Point Arena basin. All leases were relinquished by June 14, 1968. For a complete discussion of the history of the POCS Lease Sales see the Pacific Summary Report April 1985 (MMS, 1985).

(b) Oil and Gas Infrastructure

Although there are no oil and gas facilities supporting OCS development in the Northern California Planning Area, Pacific Gas and Electric has a gas pipeline going into Eureka.

(c) Proposed Polymetallic Sulfide Minerals Lease Offering

The Department of the Interior continues to investigate the potential for metallic sulfide deposits (principally copper, zinc, and lead) along the Gorda Ridge offshore Oregon and California. For a discussion on the Proposed Polymetallic Sulfide Minerals Lease Offering see Section IV.B.7.a.(2)(c).

(3) Physical Environment

(a) Impact on Water Quality

Water quality in the northern California OCS will be affected by a variety of liquid and solid wastes that are associated with offshore oil and gas exploration and development. These wastes were characterized and their general impacts on water quality were described in Section IV.B.7.a.(3)(a).

The primary impact producing agents that affect water quality that are associated with the proposal include 1) drill muds and cuttings, 2) produced water, 3) sediment resuspension, and 4) accidental oil spills. The remaining discharges and leachable materials mentioned above are of secondary and minor importance because of their small volume, small concentration or temporary occurence. Domestic and sanitary wastes are treated by an activated sludge system and are chlorinated before discharge. Effects from such domestic and sanitary waste discharges can not be measured a few meters from their discharge point and are, therefore, negligible.

An estimated 306,000 bbls of drill muds and cuttings would be discharged from the proposed northern California development. Mixing and dilution of the discharge plume from each platform would depend on the rate of discharge, discharge depth, and existing hydrographic conditions. Dilutions of 1,000-fold are expected within several meters of each discharge and very low concentrations are expected within 2,000 meters downcurrent [see Section IV.B.7.a.(3)(a)]. Localized turbidity from the plumes would reduce light penetration and, therefore, photosynthesis. Solids may accumulate on the bottom beneath the discharge plume and bury sessile benthic organisms directly or cause changes in sediment characteristics and subsequently result in changes in the benthic community. Acute toxicity from the drilling muds and cuttings is not expected because of rapid mixing, and because drilling fluids have low toxicity (Neff 1985). Chronic or sublethal effects may include bioaccumulation of metals by some organisms, but such effects are poorly understood. Long-term effects (e.g., changes in behavior, metabolism or reproduction), if any, would be restricted to areas near the platforms. Overall, moderate impacts from drilling muds and cuttings are expected at the platforms, while regional impacts will be low.

A total of about 173.2 m bbls of produced water containing particulate matter, hydrocarbons, dissolved inorganic ions and metals, with characteristically low dissolved oxygen, low pH and high salinity, would be discharged from the development platforms. These discharges pose little threat to the marine environment. Numerous studies (summarized in Boesch and Rabalais 1985) suggest that produced waters are virtually non-toxic. Although field work indicates the potential for bioaccumulation of petroleum hydrocarbons from undiluted produced waters, mixing and dilution would be very rapid after discharge and organisms would be little affected. Impacts from produced waters are considered to be low for the region, but adjacent to the platforms, impacts will be moderate because of measurable increases in trace metals and dissolved hydrocarbons.

Bottom sediments will be disturbed during exploration and development activities associated with platform and pipeline installations. Sediment resuspension will cause turbidity plumes and result in reduced sunlight penetration and a decrease in phytoplankton growth if the turbid water occurs in shallow waters, (i.e., <100 meters). Some sessile organisms will be buried directly, especially during pipeline trenching when relatively large quantities of sediment will be displaced. Resuspended sediment that was previously polluted with hydrocarbons, metals or pesticides might be a source of contamination for organisms exposed to the sediment plume but little existing sediment contamination is evident off northern California.

Impacts associated with sediment resuspension are short-term, localized and are considered low impacts.

One spill of larger than 1,000 barrels is assumed far this analysis. As indicated in Section IV.B.7.a.(3)(a), the fate and effects on water quality of a spill depend upon a number of factors including the spill's size, location, proximity to shore, season, and sea and weather conditions. In the open ocean and in moderate to high seas, a spill is rapidly dispersed and "weathered" by physical and biological processes such as evaporation, oxidation, emulsification, and uptake and metabolism by marine organisms. Over deep waters, some components of the oil would eventually reach bottom sediments in low concentrations, and potentially over a wide area. Spilled oil might persist for long periods if the oil residues reached shore and were driven into beach sands or estuarine sediments and were subsequently covered and uncovered during normal tidal exchange. Degradation in water quality could range from a moderate impact for a small spill in the open ocean to a very high impact for a large spill. Any oil which entered relatively calm waters of enclosed bays and estuaries would result in high impacts.

The most significant effects on northern California ocean water quality from the proposed project will be from discharges of muds and cuttings, produced waters and from sediment resuspension. Plankon exposed to discharge and sediment plumes will be temporarily affected. Benthic communities are likely to change as a result of altered sediment parameters (i.e., grain size) or burial by sediments or muds and cuttings solids. Acute mortality of marine organisms from platform discharges or sediment resuspension is not expected because of relatively low toxicity and rapid mixing and dilution of oil discharges. Some marine organisms are expected to incorporate some metals and hydrocarbons into their tissues, which may result in subtle reproductive, metabolic and biochemical changes of unknown significance. An oil spill could have very high impacts if the oil became entrained in calm bays and estuaries where it might persist for many months.

CONCLUSION: Overall, low impacts are expected from the project.
CUMULATIVE IMPACTS: Water quality for most of the northern California planning region is excellent, but an exception occurs in Humboldt Bay where municipal wastes, industrial wastes, and general port activities have degraded water quality. Drilling muds and cuttings, formation water, and resuspended sediments from the proposed OCS activities will cause moderate impacts.

Significant degradation of existing water quality and marine communities is confined to Humboldt Bay. Discharges associated with potential oil and gas development will degrade water quality in small areas adjacent to platforms and pipeline routes.

CONCLUSION: Localized impacts may be moderate, on a regional basis, however, cumulative impacts will be low.

(b) Impacts on Air Quality

Two platforms are expected to be installed in the planning area. Impacts due to the aggregate emissions from all these platforms are possible, but are unlikely to be serious if they occur. Each of the platforms likely will affect the onshore coastal area for 5-10 years during exploration, platform installation, and development drilling and for about 30 years during the production phase. These impacts at a particular location are the critical factors and are dependant on the location of platforms, the phase of operation and its level of activity and the number of platforms that can potentially affect the onshore air quality at that location. In reality onshore impacts will be spread along the entire coastline in relationship to the location and distance from shore of the platforms. Only if the platforms were located close together and near to shore would impacts onshore be a significant problem. This is unlikely for two reasons: (1) it is generally more economical to develop an area from one platform, rather than drill from several smaller platforms scattered over a very small area; and (2) if platforms are close together and impacts are possible, the onshore impact would be mitigated by the cumulative impact provisions of the DOI rules.

OCS facilities located within 20 miles of the coast should likely require emission controls. No new onshore refineries or gas processing plants are required under this alternative.

A low qualitative impact is expected from routine emissions. No new major onshore sources which would cause severe local impacts are forecast. Uncontrolled pollutant emissions from nearshore offshore sources could cause onshore air quality impacts in excess of the DOI air quality rules significant levels. For example, assuming 3 months of development drilling occurs immediately upon completion of platform installation, 525 tons of NO_x could be omitted in 1 year based on the representative emissions. If this platform were located beyond 16 miles from shore, it would be exempt from DOI emissions controls.

Any emission sources which would adversely affect the onshore air quality would be subject mitigation required by EPA and the State, if located onshore, or by DOI, if located on the OCS. Required controls would conform with Best Available Control Technology (BACT), and emission offsets, if needed.

CONCULUSION: The proposed project would not significantly affect onshore air quality. Impacts on air quality would be low.

CUMULATIVE IMPACTS: Impacts on air quality were considered by including all other future projected offshore and onshore projects. Offshore development in this case would include an additional production platform. This would result in greater total offshore emissions. However, since the platforms are likely to be spaced considerable distances apart, maximum air pollutant concentrations would not differ significantly from those associated with an individual platform. Air pollutant concentrations from offshore sources would be well below DOI Significance Levels.

The major influencing factors affecting the onshore air quality in Northern California as a result of OCS development are: (1) the number of new wells drilled; (2) the location of the platforms; (3) the timing of the activities; (4) the magnitude of the produced products tankered out of the area; and (5) the local instantaneous meteorological conditions. Prevailing winds off Northern

California are from the west and northwest. Temperature inversions are present during most summer months and to a lesser extent during the winter. The proposal contributes moderately to regional cumulative air quality and from low to very high to localized cumulative air quality impacts.

An increase in oil and gas development anticipated could occur as the Northern California area grows in population as a result of unrelated industrial and commercial growth in the region. In most cases, oil and gas activities will be a very small part of this overall growth. It is unlikely that the cumulative imapct of this overall growth could increase ambient pollutant concentrations to a level where some future industries would be forced to comply with stringent emission controls to avoid exceeding air quality standards.

CONCLUSION The cumulative impacts from all future projected developments in the project area would be low.

(4) Biological Environment

(a) Impacts on Plankton

DISCUSSION: The impact on phytoplankton and zooplankton in the lease sale region will come from drilling muds, formation water (if it is discharged) sewage, and spilled hydrocarbons. These agents and their effects on plankton have been discussed further in Section. IV.V.7.a.(4)(a) of this document. The deleterious effects of oil and gas activity on plankton populations, especially oil spills, is felt to be nonsignificant, due to the spatial and temporal variability of plankton in the marine environment. Phytoplankton may experience small blooms in the areas around spills, not within the spills.

The impacts caused by the 20 exploratory wells and 48 development/production wells on two platforms would be very low, and will occur only within the water affected by drilling muds, formation waters, sewage and small oil spills. The probability of a large 1,000 bbl or greater spill occurring is 32 percent. Should a large spill occur, impacts to plankton would be low. The overall impact to the plankton population would be negligible. If a spill becomes trapped within an eddy system, impacts would be moderate.

CONCLUSION: The impact on the overall plankton population of the area would be very low.

CUMULATIVE IMPACT: Impacts to the plankton population of the area would remain negligible if oil spills occurred a few months apart because impacts would be limited to the areas affected by oil. The same would be true with impacts caused by the three platforms predicted.

CONCLUSION: Impacts to plankton would be very low.

(b) Benthos

(i) Intertidal

Impacts to intertidal communities could be caused by oil spills from platforms, tankers or the installation of a pipeline. Drilling platforms and related activities are not expected to cause impacts to intertidal communities because they are three or more miles away. During pipeline installation, damage to the communities within an area about 20 m wide would occur where the pipeline comes ashore. Recovery from this type of disturbance should proceed normally within 2 years and with no toxic residues left in the area from the operation. A more detailed description of the generic impacts on intertidal communities is presented in the central California Section.

Impacts from a large oil spill would cause mortality to rocky shore intertidal organisms from smothering. Toxic related mortality is also possible, particularly if oil were to reach shore in a matter of hours.

Table III.B.8.1-1 lists rocky intertidal areas in northern California which are thought to be more sensitive to oil spill impacts than other areas of the coast.

As with the other areas, the extent of damage to a sandy beach intertidal community from a large spill will be less than that to a rocky intertidal community.

One spill is assumed for this analysis. Should a large spill occur and contact an intertidal habitat, the contact would cause a decline in the population contacted resulting in a change in the distribution and abundance of a species or assemblages. The expected duration of the effects within the local area is three to five years for the areas listed in Table III.B.8.1-1 as being more sensitive than the norm. Impacts would be local, the planning area would not be altered overall.

Impacts to sandy beach intertidal areas from a large oil spill would vary from low for gently, sloping beaches to very low for short steep beaches. Most areas are likely to sustain very low impacts because the high wave energy of northern California prevents the formation of many semi-protective long sloping beaches.

CONCLUSION: The impacts would be local, no alteration of the planning area overall would occur, impacts would be very low.
CUMULATIVE IMPACTS: The total number of large 1,000 bbl or greater spills from all future, past and present oil activities is approximately one.

The impacts from a large oil spill reaching intertidal areas would remain low for most rocky intertidal and some sandy beach areas and moderate for more sensitive rocky intertidal areas.

CONCLUSION The impacts would be low for rocky intertidal and sandy beach areas.

(ii) Subtidal

DISCUSSION: The continental shelf of Northern California is gradually sloping to the continental slope. Although it is periodically cut by canyons or interrupted by biologically important shallow banks or sea mounds, the shelf along Northern California is a typical continental shelf in contrast to the atypical Southern California continental shelf. The sediment of the Northern California shelf generally grades from coarser sandy sediment in shallow water nearshore to finer silt and clay substrates in the deeper waters near the outer margin. The benthic invertebrates similarly grade from filter or suspension feeders on sandy substrates to deposit feeders in finer sediments. Although little information is available on the bottom communities of the region, it is reasonable to assume that they are productive and diverse owing to the indirect evidence of abundant upwelling and high fisheries landings. California kelp forests gradually decrease in Northern California. Activities which may adversely impact subtidal dwelling organisms include: emplacement of drilling platforms, discharge of drill cuttings and muds, pipelines construction, and oil spills. Further information on these impacts in general, refer to Section IV.B.10.a.(4)(b) on the subtidal benthos of southern California.

Little information is available on the bottom communities of the northern California region, but it is reasonable to assume that they are productive and diverse owing to the indirect evidence of abundant upwelling and high fisheries landings.

The impacts caused by the 20 exploratory wells and 48 development/production wells on two platforms would be very low for nearly all exploratory wells and very high in the immediate vicinity of production platforms. The life expectancy of production platforms is 5 years and the combined drilling and platform impacts referred to above and summarized in Section IV.B.10.a.(4)(b) should last at least for the duration of the platform.

CONCLUSION: Impacts to subtidal benthic will be very low.

CUMULATIVE IMPACTS: Impacts from three platforms rather than two will cause very high impacts immediately around three platforms rather than two platforms. The impact on the ecology of the planning area would be negligible.

The total number of large 1,000 bbl or greater spills from all future, past and present oil activities is approximately one (0.69) with a 50 percent probability of one or more large spills occurring. The potential impacts discussed above would remain the same (low) but the potential for such an event would increase.

CONCLUSION: Impacts on subtidal benthic organisms will be low.

(c) Impacts on Fish Resources

The general impacts to fish resources are discussed in Section IV.B.7.a.(4)(c) for the Washington and Oregon planning area. Fisheries in northern California are very similar to those to the north, so the comments regarding impacts to anadramous salmonids, flat-fishes, and shellfishes are especially germane here.

Surface fishes are especially susceptible to damage from spilled oil since it tends to remain on the water's surface. However, the very low projected spill potential (one spill is assumed) for the planning area makes the potential impact to fish like northern anchovy, Pacific herring, and surfperches very low.

The impacts to rockfishes are also expected to be very low, but could be low. The potential for impacts to planktonic eggs and larvae is the biggest concern. The major factor in this concern is the broad geographic range and large population sizes of most rockfish species.

Salmon populations vary widely from year to year as a result of myriad impacts and variables on their complex life history, both in freshwater and the marine environment. As a result, impacts to these populations could be as high as moderate. However, because of the expected low level of OCS activity as a result of this 5-year plan, the low risk of an oil spill, and the anticipated low level of seismic exploration, the expected impact to salmonids is very low.

Bottom dwelling flatfishes, most likely to be affected by settling sediment in the adult stage and seismic exploration during the larval stage are also expected to be affected to a very low degree because of the anticipated low level of OCS related activity.

Dungeness crabs have a broad distribution and planktonic larvae and should be capable of recovering from localized losses as might be anticipated from this plan. However, population numbers fluctuate widely from year to year. As a result of these factors, localized crab populations could be affected to a moderately high degree, but are expected to be affected at a very low to low degree.

CONCLUSION: Overall, the expected level of impact to northern California fishes from sales resulting from this proposed plan is very low.

CUMULATIVE IMPACTS: Any impacts occurring to fish resources as a result of petroleum leasing and related activities will be in addition to negative impacts associated with other natural and cultural factors.

Additionally, leasing activities resulting from this 5-year plan could lead to discoveries which would lead to further leasing and ensuing actions which could compound the above mentioned negative impacts.

Because of restricted populations and their complex life cycles, salmonids would likely be the most severly impacted. Local populations could be affected to a very high degree, but because of numerous populations and overlapping life cycles of different generations, the net impact is expected to be low.

Dungeness crabs, because of yearly population fluctuations, could also be impacted to a very high degree on a localized basis. This is especially true is succeeding severe impacts occur to a concentrated population. Due to their wide range, however, the net impact should be low.

Because of discrete spawning areas, dover and petrale sole could be impacted to a high degree if structures and activities are concentrated so as to negatively affect these critical areas. However, due to the locations of these areas the cumualtive impact is expected to be very low to low.

Other fish species are expected to be affected to only a very low degree, on a cumulative basis.

CONCLUSION: The expected level of cumulative impacts to overall northern California marine fish resources is low.

(d) Impacts on Marine Mammals

Marine mammals breeding or migrating through Northern California waters will experience the same types of impacts as described for the Oregon/ Washington Planning Area. Overall, impacts to whales and other cetaceans from normal operations are expected to be very low from the proposal. Increased noise and disturbance from exploratory activities and the installation and production from the two platforms anticipated are not expected to result in measurable impacts to these species. However, normal operations could have low to moderate impacts on pinnipeds. Several large pinniped breeding and hauling areas occur in Northern California. Vessel and air traffic near these areas could result in locally moderate to high impacts if onshore support bases or traffic corridors were located nearby. These impacts can be effectively avoided if the location of nearby pinniped areas are considered where vessel and air corridors are identified.

Over the life of the proposal, production of the 231 million barrels of estimated oil reserves in Northern California are expected to result in one spill greater than 1,000 barrels. The probability of one or more spills occurring is 32%. Cetaceans could experience low to moderate impacts if contact with oil was made. Cetaceans which occur in groups within the planning area, such as gray whales during migration, are more likely to sustain moderate impacts from an oil spill due to the probability of several individuals being present at one time. Breeding pinnipeds could sustain locally high ecological impacts if contacted with oil. Nonbreeding pinnipeds could sustain less severe but still low to moderate ecological impacts. Pinnipeds which occur frequently at sea in this area, such as California and Stellar sea lion, are more likely to contact an open water spill. If contacted with oil, northern fur seals, which are particularly abundant off the Viscano Knoll and Gorda Escarpment in winter, are likely to suffer mortality and locally high impacts. Northern fur seals are not likely to suffer high impacts as a species since it does not breed in Northern California.

CONCLUSION: Overall impacts to marine mammals from activities associated with this proposal are expected to be low.

CUMULATIVE IMPACT: The cumulative impact of OCS activities on marine mammals would probably have low to moderate levels of impact similar to, but greater than what is projected for the proposal. Potential impacts from normal oil and gas activities to marine mammals would probably increase slightly but remain very low. The expected number of oil spills greater than 1,000 barrels is one. The greatest oil spill risk is from foreign and domestic tankering along this coast.

Multiple spills in the same area during the life of the proposal could elevate significant impacts at least one level due to the inability of a population to recover before a second event.

With or without the proposal, some marine mammals are expected to suffer low to moderate impacts over the life of the proposal. Migrating species are subjected to stresses from municipal and industrial discharges and other human activities, including existing oil and gas operations throughout California. Although ocean waters off northern California are relatively clean, migrating species may suffer low level impacts and a general degradation of health is possible. Overall, impacts are expected to be regionally low and most species are expected to maintain viable populations.

CONCLUSION: The cumulative impacts from the proposed OCS lease sales in the Northern California Planning Area combined with other OCS and non-OCS activities within the range of migrating marine mammals will have low impacts on most species.

(e) Impacts to Coastal and Marine Birds

Coastal and marine birds nesting or migrating through the Northern California Planning Area will be susceptible to the same impacts as those discussed Oregon/Washington. Normal activities are expected to have low impacts to avian species, however, the potential exists for locally high impacts if activities occur near nesting areas. Noise and disturbance from air and vessel traffic are potentially the most threatening impact to these birds. The most important nesting areas are located at Castle Rock, False Klamath Rock, Green Flatiron Rock and south to Trinidad Head. Those colonies most likely to be affected include the sizeable murre and cormorant colonies near Cape Mendocino, and scattered aggregations of Brandts' and Pelagic cormorants, Western gulls, and pigeon guillemots. Although periods of high noise levels are expected to be brief, high impacts are still considered possible. If care is taken to avoid disturbing nesting areas, impacts from noise will probably be low. Furthermore, the chances of a vessel or air traffic corridor being located nearshore one of these important rookeries is unlikely. Since little is known about long-term effects of platform discharges to avian species, impacts from this source are considered uncertain.

Over the life of the proposal, production of the estimated 231 million barrels of oil are expected to result in one spill greater than 1,000 barrels. The probablility of one or more spills occuring is estimated to be 32%. If a spill were to hit a seabird rookery, such as Castle Rock, during the breeding season many birds, especially murres and auklets, would probably perish due to oiling and hyperthermia. Non-nesting birds might also die from exposure to toxic fractions, inhalation, and irritation of mucous membranes. If juveniles were ready to fledge, the losses would increase substantially. Locally high impacts would occur. If other areas of the coast were contacted by a spill, impacts would be lower due either to the migratory status of the impacted birds or the fewer birds concentrated for nesting. Chances of a spill contacting a non-breeding area are higher than a breeding colony. Low to moderate impacts would occur to most migratory species.

The greatest offshore concentrations of marine and coastal birds is over the broad continental shelf area north of Cape Mendocino. Those species most likely to contact an open water spill include Black-footed albatross, Northern fulmar, Fork-tailed and Leach's petrels, sooty shearwaters, phalaropes, kittiwakes and alcids (murres, auklets, and puffins). Alcids are probably the most susceptible to sustaining high ecological losses if contacted with oil. Locally high impacts to this species could occur.

CONCLUSION: Overall, activities are expected to have low impacts to marine and coastal birds in this Planning Area.

CUMULATIVE IMPACTS The cumulative effect of OCS development activities on marine and coastal birds would probably have low to moderate levels of impact similar to but greater than what is projected for the proposal. Total resource development assumes that three platfroms are required to develop the resources. Potential impacts from normal activities to marine and coastal birds would probably increase but remain very low. Platform discharges are not expected to have effects on marine and coastal birds although prey species of some birds may be affected (see Fishes, Plankton). Overall, impacts are expected to remain very low from normal activities.

The expected number of oil spills greater than 1,000 barrels is one assuming total resource development. The corresponding probabilty one or more spills occurring is 50%. The risk of an spill from this proposal account for almost all of the risk for this Planning Area. The cumulative, or expected number of spills and spill probabilities from all sources is the same as the total resource estimate. Marine and coastal birds could experience locally high impacts if contacted with oil. Multiple spills in the same area during the life of the proposal could elevate significant impacts at least one level due to the inability of a population to recover before a second event.

With or without the proposal, some coastal and marine birds are expected to suffer low to moderate impacts during the life of the proposal. Migrating species are subjected to stresses from anthropogenic sources throughout the Pacific coast. Loss of habitat and human disturbance have been and will probably continue to be the most serious impacts to avian fauna. Many important breeding colonies off northern California are now protected areas (i.e Castle Rock). Overall, impacts are expected to be regionally low to moderate and most species are expected to maintain viable populations.

CONCLUSION: The cumulative impacts from the proposed OCS and lease sales in the Northern California Planning Area, combined with other OCS and non-OCS activities within the range of migrating birds will have moderate impacts to coastal and marine species.

(f) Impacts to Threatened and Endangered Species

Threatened and endangered species breeding or migrating through the Northern California Planning Area will be susceptible to the same impact sources as those discussed for Oregon/Washington. Impacts to sea turtles are the same for Oregon/Washington. A formal Section 7 Endangered Species Consultation of MMS with NMFS and the FWS was conducted for the proposed Northern and Central California planning area (Sale 73). The biological opinion from the FWS was dated June 8, 1983 and covered american peregrine falcon, bald eagle, brown pelican, California least term, California clapper rail, light-footed clapper rail, Morro Bay kangaroo rat, salt marsh harvest mouse, southern sea otter, San Francisco garter snake, Santa Cruz long-told, salmondes, smith's blue butterfly, unarmoffed threspined stickleback, and salt marsh birds beak. The biological opinion from NMFS is dated.

See Chapter V for a further description of the Consultation process for Section 7 of the Endangered Species Act of 1973.

The MMS prepared a request for information concerning the proposed 5-year OCS oil and gas lease sale program. A response from NMFS dated November 6, 1985 is included in Chapter V. Specific effects for species in the Northern California Planning Area are discussed below:

California Brown Pelican: Normal activities are not likely to impact the brown pelican. This species does not nest within the Northern California Planning Area and is not an abundant forager in these waters. Some disturbance to foraging birds could occur due to vessel traffic but impacts would be very low. Accidental oil spills could cause mortalities to individual birds in the area if contacted with oil. However, potential impacts to this species are considered low to moderate due to the low numbers of pelicans potentially impacted from a spill.

Peregrine Falcon: Normal activities are not likely to impact this species. Peregrines are uncommon visitors to waters off the Northern California Planning Area. When observed, they are primarily in wetland habitats during the winter months. An accidental oil spill could cause locally moderate to high impacts to peregrines if important feeding areas were contaminated, and prey were oiled. Loss of one of the 50 breeding peregrine pairs in California would have locally very high and regionally high impact to the species. The likelihood of an oil spill occurring, and entering an area where peregrines feed is very low.

Bald Eagle: Normal activities are not likely to impact this species. Accidental oil spills could cause ecological losses if important feeding areas or prey items are contaminated with oil. Individual birds could perish from contacting and consuming oiled prey. Locally moderate to high impacts could occur. The probabilty of a spill occuring and contacting important bald eagle habitat is very low.

Southern Sea Otter: The southern sea otter is not known to occur in northern California and therefore is not likely to come into contact with any normal or accidental activites associated with the proposal. Occasional vagrants could be impacted by an accidental oil spill. Loss of these animals would not cause impacts of regionally low significance. In the event northern California is selected by the USFW as the site for their translocation project, potential impacts to this species would need to be reevaluated.

Gray Whale: Normal activities are likely to cause low impacts to gray whales due to noise impacts associated with oil and gas seismic operations. Potential disturbance from the one platform expected in this area will be very low to low. In the event a spill occurred, gray whales could experience regionally low to moderate impacts since the entire population could be contacted during migration. The probability of one or more spills occurring is very low (8 %).

Other Whales: Impacts to other whales are expected to be low from normal activites due to the few individuals of each species which are likely to occur in the northern California area at any one time. Low level and short-term impacts from seismic noises are considered likely. Noises generated from the one platform expected from this proposal will have low impacts. Accidental oil spills are similarly unlikely to contact these species due to their in-frequent appearances in the area. Individual whales, if oiled, could perish or suffer low to moderate impacts from physiological stress. Locally moderate to high impacts could occur.

CONCLUSION: Impacts to threatened and endangered species in the Northern California Planning Area are expected to be low.

CUMULATIVE IMPACTS The cumulative effect of OCS development activities on threatened and endangered species would probably have low to moderate levels of impact similar to but greater than what is projected for the proposal. Total resource development assumes that three platfroms are required to develop the resources. Potential impacts from normal activities to threatened and endangered species would probably increase but remain low. Platform discharges are not expected to have effects on these species although prey species of some birds may be affected. Overall, impacts are expected to remain very low to low from normal activities.

The expected number of oil spills greater than 1,000 barrels is one assuming total resource development. The corresponding probabilty one or more spills occurring is 50%. This increment of risk contributed by the proposal is considered high in terms of the cumulative risk for oil spills from all sources in the Planning Area. The probability of one or more spills occuring is 99+%. Most threatened and endangered species would experience locally high impacts if contacted with oil. Multiple spills in the same area during the life of the proposal could elevate significant impacts at least one level due to the inability of a population to recover before a second event. The chances of two spill contacting the same area twice are very low.

With or without the proposal, some species are expected to suffer low to moderate impacts during the life of the proposal. Migrating species are subjected to stresses from anthropogenic sources throughout the Pacific coast. Brown pelicans suffered severe breeding losses as the result of DDT discharged from municipal and industrial outfalls in southern California. Loss of habitat and human disturbance have been and will probably continue to be the most serious impacts to avian fauna. Overall, impacts are expected to be regionally low to moderate and most species are expected to maintain viable populations.

CONCLUSION: The cumulative impacts from the proposed OCS lease sales in the Northern California Planning Area, combined with other OCS and non-OCS activities within the range of threatened and endangered species will have moderate impacts.

(g) Impacts on Estuaries and Wetlands

Estuaries, and Wetlands: Estuaries in Northern California are numerous and contribute significantly to the coastal ecology. Northern California contains several of the larger estuaries as well as many smaller estuaries which are important to wildlife and the ecology of the area. Over half of the estuaries considered important in Northern California are closed to the sea for various periods during the summer and fall.

Proposal-related factors potentially affecting wetlands are oil spills and possible onshore construction. The activities associated with offshore drilling and platforms are not expected to cause impacts on estuaries and wetlands. General impacts or estuaries and wetlands are discussed further in Sections IV.B.9 and 10.a.(4)(g) for central and southern California. Impacts on fish, marine mammals, and endangered species of estuaries are discussed in Sections IV.B.8.a.(4)(d),(e),(f), and (g).

Estuaries within northern California having normal openings of 100 meters or greater are the Klamath River, Humboldt Bay, Eel River Delta and Ten Mile River.

One spill greater than 1,000 barrels is assumed for this analysis. Should a large oil spill occur and enter an estuary the impact would be very high if the oil covered a significant portion of the estuary and remained for several tidal cycles in Northern are more difficult to protect (high wave action occurs a greater percent of the time in this planning area). The likelihood of an oil spill causing high impacts is higher. However, only one spill is assumed to occur and the risk of much damage to coastal resources is low. Some onshore development may occur in coastal areas related to population increases. Adverse impacts associated with this is not considered likely due to constraints imposed by coastal zone legislation and plans.

CONCLUSION: Estuaries and wetlands will experience low impacts.

CUMULATIVE IMPACTS: The total number of large 1,000 bbl or greater spills from all future, past and present oil activities is approximately one with a 50 percent chance of occurrring. The low to very high impacts predicted from a spill and contact are discussed above. If the additional platform (or any of the orignial two) is located directly off the four estuaries with "wide" 100 meter openings, Klamath River, Humboldt Bay, Eel River or Ten Mile River, a spill that would flow directly to any of them directly inshore from the platforms would be difficult to contain or divert before entering the estuary.

CUMULATIVE IMPACT CONCLUSION: Estuaries and wetlands will experience low cumulative impacts.

(h) Impacts to Areas of Special Concern

Areas of special concern include marine life refuges, ecological reserves, areas of special biological significance (ASBS) and underwater parks and are designed to protect intertidal and shallow water subtidal inhabitants. Impacts on these areas are discussed more fully in Section IV.B.9.a.(4)(h) and IV.B.10.a.(4)(h).

There should be no significant impacts to areas of special concern in northern California from the combined 68 exploratory and development/production wells on two platforms from normal operations because of the distance separating the platforms and areas of special concern. The probability of a large 1,000 bbl or greater spill occurring is 32 percent. Should a large oil spill occur and contact an area of special concern, the impacts will vary from low for shallow subtidal and intertidal areas (see Section IV.B.7.a.(4)(b)) and very high for a massive spill entering and remaining for several tidal cycles for estuaries (see Section IV.B.8. a.(4)(g)). Impacts on marine mammals and birds will range from low to moderate.

CONCLUSION: Impacts to areas of special concern are expected to be very low.

CUMULATIVE IMPACTS: The total number of large 1,000 bbl or greater spill from all future, past and present oil activities is approximately one (0.69) with a 50 percent of one or more spills occurring.

CONCLUSION: Impacts to areas of special concern will be low.

(i) Impacts on National Marine Sanctuaries

There are no National Marine Sanctuaries off northern California.

(5) Socieconomic Environment

(a) Impacts on Employment and Demographic Conditions

The impact agents which affect the demographic and employment conditions are discussed in Section IV.B.7.c.(5)(a)

Increases in population, employment and income as a result of the proposal are to peak in 1996, and permanent changes in population, employment and income are expected to be level from 2000 to the conclusion of production in 2025. Employment is expected to peak at 1,298 jobs and then decline to 72 jobs for the remainder of the project life. Six hundred thirty of the peak jobs or 35 of the permanent jobs are expected to be in the oil and gas industry. Population is expected to rise by 1,600 people in the year 1991 and level off at 89 new residents for the remainder of the project life. Personal income as a result of the proposal is expected to peak at approximately $20.6 million and to level off in 2000 at $1.1 million.

CONCLUSION: The overall impacts as a result of the proposal are considered to be low.

CUMULATIVE IMPACTS: Cumulative impacts are expected to result in change in population, employment and income and are expected to peak in the years

1998-1999, and permanent change in population, employment and income are expected to level from 2000 to the conclusion of production in 2025.

Employment is expected to peak at 1,710 jobs and then decline to 216 jobs for the remainder of the project life. Eight hundred and thirty of the peak jobs or 105 of the permanent jobs are expected to be in the oil and gas industry. Population is expected to rise by 2,108 people in the years 1998-1999 and level off at 266 new residents for the remainder of the project life. Personal income is expected to peak at approximately $33.5 million and to level off in 2000 at $4.2 million.

CONCLUSION: The overall impacts are likely to be low.

(b) Impacts on Land Use and Water Services

(i) Land Use

Like Washington and Oregon, northern California does not have any current Pacific Outer Continental Shelf oil and gas development. The region, as a result, lacks an integrated system of onshore facilities to process and transport OCS oil and gas. Under the proposed action, two platforms are anticipated to be built by 1996 in the northern California planning area.

During the exploratory phase a temporary support base or bases (5-10 acres each) would be needed. Nearly any harbor with industrially zoned land would be suitable. Due to the temporary nature of the exploratory phase, land use impacts beyond the actual construction of a support base are expected to be very low.

The construction phase will generate the greatest impacts to land use and are expected to be moderate due to the need for new construction. Due to the shortage of potential landfalls, Eureka and Crescent City would be potential sites for development. Facilities which could potentially be expected to be constructed, would include a permanent service base (25 to 50 acres), a gas processing and treatment plant (50 to 75 acres), pipeline installation and service base (5 acres), and pumping stations (40 acres each). Land use impacts are expected to be limited as only one platform will be sending its gas production onshore. The other platform will re-inject its gas. The oil produced would be tankered to existing facilities in San Francisco.

During the production phase additional land use impacts will be very low. Temporary facilities constructed to support the construction phase would be shut down. The layoff of construction workers would result in a slight population decrease thereby alleviating some of the demand for existing housing. Sufficient commercial land is available to support expected increases in business resulting from offshore oil and gas development.

Decommissioning will result in an increase in construction activity to dismantle the platform and to shut down any other facilities no longer needed. The effect on land use will be to make developed industrial land available for other industrial uses, thus alleviating the need to develop new industrial land. Land use impacts are expected to be very low.

CONCLUSION: Impacts from the proposal will be very low.

CUMULATIVE IMPACTS: Unless existing facilities are unable to handle increased gas production, land use impacts are expected to be virtually non-existent. The possibility exists that an additional platform and pipeline may be constructed. If additional support facilities are needed, they would be constructed near existing facilities to comply with California Coastal Zone policy. Cumulative indirect impacts that may be expected would be increased demand for commercial and residential space.

CONCLUSION: Moderate land use impacts will occur.

(ii) Water Service

Water is usually provided locally and can comprise a significant portion of municipal or district budgets. Central and Northern California's water supply comes from surface water and local groundwater basins. Water supplies are considered adequate for existing and some additional development in most parts of planning area.

CONCLUSION: Impacts are expected to be very low.

CUMULATIVE IMPACTS: The existing sewer and water system appears to be adequate. The possibility exists that non OCS economic development may result in population increases that may strain the existing system.

CONCLUSION: Impacts are expected to be very low.

(c) Impacts on Commercial Fisheries

General impacts to commercial fisheries are discussed in Section IV.B.7.a.(5)(c) regarding Washington and Oregon. Offshore fish species and commercial fisheries of northern California are very similar to those of the rest of the Pacific Northwest.

The dungeness crab fishery with its shallow water occurrence and dependence on widely variable year class abundance could be affected by OCS activities in northern California, especially in high use areas off the mouths of the Eel and Klamath Rivers and Humboldt Bay. However the rough weather and heavy seas frequently encountered during the winter fishing season and the low level of OCS activities as a result of this plan will probably keep impacts to a minimum except in local areas of oil spills where very high impacts are possible. Planning area wide impacts are espected to be low or very low because of the crab's wide distribution and high reproductive potential.

Localized impacts to salmonid fisheries could also be high or very high as discussed for Washington and Oregon, but likewise the overall, planning areawide impacts are expected to be low or very low. Critical areas are dependent more on the fish's life history than any other factor. These areas are within about a 10 to 15 mile radius of the spawning streams and rivers.

Dover and petrale sole fisheries, because they tend to occur in the discrete spawning areas, could also be affected if platforms and related facilities, or other activities, are placed within these areas. However, most of these are at depths where economical production of petroleum resources is not yet likely, so impacts as a result of the proposed plan are expected to be very low.

Fisheries for rockfishes are expected to be affected at a low level, and probably a very low level because of the large size of these populations and the fact that fishery areas for them are usually over bottom types not amemable to offshore facility siting. There is concern about seismic exploration activity altering their feeding habits and damaging or killing egg and larval stages (see Fish Resources section) but this cannot be fully evaluated until ongoing and planned studies are completed.

Surface fisheries for herring, anchovy, smelts, and similar fish are small in this region and impacts are expected to be very low.

Trawl fisheries for Pacific Ocean shrimp could be affected by vessel traffic conflicts and seismic exploration impacts to juveniles, but such impacts are expected to be very low, as are impacts to the fisheries.

CONCLUSION: Overall, planning area wide impacts to fisheries are expected to be low.

CUMULATIVE IMPACTS: Long term OCS activities resulting from the possible discovery of substantial amounts of economically recoverable reserves would be expected to increase. Increased offshore facilities could impact crab and trawl (especially flatfish) fisheries by reducing the availability of traditional fishing grounds. Increased vessel traffic would conflict with drag routes for all trawled species and increase competition for available harbor facilities for all fishermen.

The lack of onshore facilities and large harbors will delay OCS activities buildup if a large find is made in this area. This will reduce the impacts of future discoveries on the commercial fishing industry.

CONCLUSION: Cumulative impacts on northern California commercial marine fisheries as a result of OCS activities are expected to be low.

(ii) Recreational Fisheries

As with commercial fisheries, impacts to larger species will affect sport fisheries. Increased OCS vessel traffic will not have as big an impact recreational fishermen as on commercial ones because of better vessel mobility and the lack of use of set gear. The projected platform might attract target species which could increase catches.

CONCLUSION: Impacts to sport fisheries will be very low.

CUMULATIVE IMPACTS: Long term impacts are similar to short term impacts. Additional discoveries leading to additional platforms would increase reef-related impacts. Increased fishing at platforms could reduce populations over time, leading to reduced catches. This could also lead to a cyclic patern in fish populations, and hence in fishing effort, leading to instability in the commercially related aspects of this resource.

CONCLUSION: Cumulative impacts are expected to be very low.

(d) Impacts on Recreation and Tourism

Offshore oil and gas operations have the potential to impact recreational resources in northern California as is described for Washington and Oregon in Section IV.B.7.a.(5)(d).

As a result of this proposal, it is estimated that in the northern California planning area one oil spill greater than 1,000 barrels will occur.

One spill is assumed to occur as a result of the proposal, and if it were to contact a beach or other shoreline oriental recreation area it could cause the closure of the area until the oil dispersed maturally or was cleaned up. Impacts would be localized in the area directly affected by the oil spill, and natural conditions or cleanup would keep the impacts limited to a relatively short period of time. Because only are spill of 1,000 barrels in larger is expected, because the likelihood of that spill reaching the coast is not definite, and because the chance of the spill reaching the coast in such a state (unweathered, undispersed by waves) that it might cause severe impacts is even less likely, the chance of impacts to reveration from an oil spill are considered very low.

The level of impact to recreation resources caused by an offshore platform is mainly visual and depends upon the distance offshore the platform is located, and the recreational resources that are on the stretch of coast adjacent to the platform site. The farther offshore a platform is located the lower the level of impact that will occur to the onshore resources.

The proposal is expected to result in the installation of two platforms. It is not known where the platforms will be located, but it is assumed one will be located off Eureka and the other off Point Arena.

The platforms are expected to have a very low impact on recreation and tourism with a localized low impact to tourism. Visual resources will suffer a very low over the planning area and a low impact at the local level. However, at the local level, certain stretches of coast could experience a moderate or high impact if the platforms are located in the first tier of tracts.

Pipeline installation can cause a short term disruption of recreational resources at the landfall during installation, but after the installation is complete the only impact will be visual. This impact will be a localized low impact to the visual resources along the onshore pipeline right-of-way.

CONCLUSION: The expected impacts to recreation and tourism and their allied resources as a result of the proposal are very low.

CUMULATIVE IMPACTS: Cumulative Impacts: Impacts to recreation and tourism, and their allied resources, are expected to occur from other projects which are described in IV.B.8.a. and which may occur in the region. However, since State and local jurisdictions have primary authority over onshore development, it is assumed that their requirements will hold the impact level to low.

As a result of future OCS proposals, there is a 50 percent probability that one or more oil spills greater than 1,000 barrels will occur. The probability of spills occurring, reaching shore, and being in such a condition that they could cause severe, long lasting impacts to the immediate area of the spill contact is so low that oil spills are expected to cause low impacts to recreation.

In addition, it is estimated that three platforms will be installed. It is assumed that the platforms will be installed off Eureka, Point Arena and Crescent City. This is expected to have a very low impact on recreational resources over the region with localized low impacts. The platforms are expected to have a low impact on the local visual resources.

CUMULATIVE IMPACT CONCLUSION: Impacts are expected to be low.

(e) Impacts on Archaeological Resources

Offshore oil and gas operations have the potential to impact archaeological resources in northern California as described for Washington and Oregon in section IV.B.7.a(5)(e).

As a result of the proposal, it is estimated that two platforms will be installed in the northern California planning area.

The impacting agents to submerged archaeological resources are bottom-disturbing activities, human activities, and the creation of magnetic anomalies. Bottom-disturbing activities can include any activity utilizing anchors for stabilization; pipeline laying activities such as trenching, use of lay or pull barges; well drilling activities either during the exploration phase (20 wells proposed) or during the development and production phase (48 wells expected); and platform construction and anchoring (2 platforms expected). Human activities are restricted to the use of divers for construction, inspection and maintenance, and equipment recovery. The placement of metal objects on the ocean floor (for example, pipelines, subsea completions, or lost equipment) may mask the signature of historic resources during a magnetometer survey. Failure to identify the resource during the survey phase may lead to its inadvertent destruction during construction exploration.

The likelihood of disturbing archaeological resources is influenced by several factors. The probability of impacts to submerged cultural resources is directly related to the number of bottom-disturbing activities that occur during the course of development, that is, the number of wells, the number of platforms, the number of subsea completions, the number of pipelines, and the number of other bottom-disturbing activities (all unknown). Submerged prehistoric sites, if they exist, would be limited to water depths of less than 150 m or at the approximate sea level of the lowest sea level regression in the last 50,000 years. Wave energy has influenced the probability of the existence of prehistoric sites. The 150 m bathymetric line extends much further into Federal waters in Northern California than in Southern California. Never the less, historic resources are most likely within 3 miles of the coast or within State-controlled waters. However, as discussed above, the possibility of shipwrecks in Federal waters does exist, particularly opposite harbors, sheltered areas, prominent land points, rocky outcrops, reefs, or near historic shipping routes. California because of the lesser number of proposed activities, while there may be a higher likelihood of impact to historic resources because of their more frequent occurrence. Overall, considering the number of proposed activities, and the size of the planning areas, a very low of level impacts to cultural resources in Northern California from OCS development are expected.

CONCLUSION: Very low impacts to archaeological resources would be expected from the proposal.

CUMULATIVE IMPACT: Impacts to archaeological resources over the region will occur both offshore and onshore as a result of the other projects described in section IV.B.8.a.(2). This is expected to result in a low impact over the planning area.

As a result of future OCS proposals it is estimated that three platforms will be installed. In addition to the impacts discussed above, impacts to archaeological resources from other projects may be expected if they disturb the sea floor. Of concern here are the expansion of any ports or harbors, sewage outfalls, State Tidelands development, and ocean dumping. All of these activities can increase the impacts to submerged archaeological resources in ways similar to those identified above.

CUMULATIVE IMPACT CONCLUSION: The impacts are expected to be low.

(f) Impacts on Marine Vessel Traffic

See section IV.B.7.a.(5)(f) for a discussion of generic impacts.

A very small increase in marine vessel traffic (i.e. tankers, crew and supply boats, seismic exploration vessels) is expected to occur offshore northern California as a result of this proposal. This very small increase in vessel traffic would be due to supporting the level of activity anticipated in this planning area-two platforms, twenty exploration wells, and forty-eight development wells.

Although there are no official Coast Guard established shipping lanes in northern California, any increase in vessel traffic potentially increases the risk of accidents (between vessels or between platform and vessel). These accidents could result in the loss of human life, personal injuries, property damage, and oil spills. Additional conflicts could also arise from increased port congestion and competition for port facilities such as docking berths. These potential problems are expected to be minimal, however, due to the very low level of activity anticipated in this planning area (2 platforms and support activities) and the continued enforcement of Coast Guard navigational safety requirements.

Oil spills, regardless of source (vessel collisions, platform blowouts, pipeline failures, etc.) may affect vessel traffic. Traffic may have to be rerouted to avoid the area of contamination in order to avoid both direct contact with any spilled oil and to not interfere with cleanup operations.

Installation of offshore platforms would also represent a benefit to navigation through lighting, fog horns, radar, and other navigational aids.

CONCLUSION: Very low impacts are expected from the proposal to marine vessel traffic.

CUMULATIVE IMPACTS: There is currently no oil and gas activity in the OCS in northern California. Once all the tracts on the Federal OCS are leased and developed, it is estimated that three platforms, thirty-three exploration wells, and eighty-eight development wells would result. The impacts associated with this level of activity are considered very low as the increase in overall marine traffic would be minimal. Thereby increasing the risk of vessel conflicts and accidents an insignificant amount.

Tanking of Alaska oil to California ports to the south of the area can be expected to continue, and could increase with increased production on the Alaska OCS. Tanker resulting from production in Northern California will cause additional traffic but because the area is generally outside major Pacific trade routes, cumulative impacts to vessel traffic are not expected to be significant.

CONCLUSION: Impacts to vessel traffic are expected to be low.

(g) Impacts on Military Uses

Offshore oil and gas operations have the potential to impact military operations in northern California as described for Washington and Oregon in section IV.B.7.a(5)(g).

As a result of this proposal, it is estimated that two platforms will be installed in the northern California planning area. It is not known where the platforms will be installed, but it is assumed that one will be off Eureka and the other will be off Point Arena.

As most of the military activity in the planning area is conducted by the Navy and Air Force, at least 6 to 15 miles offshore, and involves mainly all weather flight training, submarine transitting, and anti submarine warfare training, a very low impact is anticipated for the installation of the platforms.

It is estimated at one oil spill greater than 1000 barrels will occur in the planning area. As oil spills have a potential to impact military uses mainly because of the increased traffic associated with clean-up operations, a very low impact is expected to military uses in the area from oil spill as a result of the proposal.

CONCLUSION: Overall impacts to military operations in the planning area are very low as a result of the proposal.

CUMULATIVE IMPACT: The cumulative impacts to military uses are not expected to be significant due to the limited areas of military use off northern California.

As a result of future OCS proposals it is estimated that three platforms will be installed, and (1) oil spill will occur in the planning area. It is not known where the platforms will be installed but it is assumed that one will be off Eureka, one off Point Arena, and one off Crescent City. As most of the military activities do not occur near the assumed platform sites, a very low impact is anticipated from the installation of the platforms.

CONCLUSION: Military uses are expected to have very low impacts.

(h) Impacts on Native Subsistence

Offshore oil and gas operations have the potential to impact native subsistence in northern California gathering of intertide/resources and salmon as is described for Washington and Oregon (see section IV.B.7.a.(5)(h).

As a result of this proposal, it is estimated that one oil spill greater than 1,000 barrels will occur in the northern California planning area. Oil spills have a potential to damage native subsistence resources primarily by direct oiling, by causing destruction of the intertidal resources during clean-up operations, and by affecting salmon populations during migration to and from streams, however, the very low number of spills expected and the temporary mature of impacts from spills indicate that the risk to nation subsistence is very low.

CONCLUSION: The expected impacts to native subsistence as a result of the proposal are very low.

CUMULATIVE IMPACTS: Impacts to Native subsistence will occur from onshore projects, which are described in IV.B.8.a.(5)(h), and these are anticipated to have a moderate impact.

It is estimated that one oil spill will occur in the northern California planning area as a result of tankering and OCS activities.

Oil spills have a potential to damage native subsistence resources primarily by direct oiling, by causing destruction of the intertidal resources during clean-up operations, and by affecting salmon populations during migration to and from stream months. The extremely low number of spill expected indicates that there is a very small risk to native subsistence from oil spills

CONCLUSION: Native subsistence will experience very low impacts from OCS and other activities.

b. Unavoidable Adverse Impacts

Oil spills, discharges of drilling muds and cuttings, formation water discharge, and sewage disposal will all cause minor unavoidable adverse impacts on water quality under the proposal. OCS development will increase the demand for onshore water services.

Unavoidable adverse impacts to ports and navigation could occur in the expected cases of oil spills. Minor traffic adjustments into and out of ports and rerouting through areas could be required.

OCS development will increase the demand for land. Land currently used for industrial uses or zoned for such uses will not experience an unavoidable adverse impact. Unavoidable adverse impacts will occur when OCS uses convert land to that use or when it displaces non OCS activity. OCS development will preclude the use of these affected land from other uses during the duration of OCS activity although this is expected to be on a highly local basis and not extensive locally or regionally.

There will be some unavoidable losses of submerged and terrestrial cultural resources. Losses are felt to be unavoidable due to the difficulty of detecting submerged and buried terrestrial resource sites.

Coastal benthic ecosystems would be unavoidably adversely affected from the proposal due to oil spills and various discharge. The level of impact is restricted geographically and temporarily.

The proposal could have unavoidable adverse impacts to fish resources as a result of oil spills, seismic operations, platform siting, and drilling discharges. Oil spill impacts would occur mainly to surface fish, those with planktonic larvae, and intertidal residents. Seismic operations impacts, if they occur, would primarily affect species with planktonic larvae. Platform siting impacts would be incurred by benthic species, especially flatfishes, and benthic invertebrates. Impacts from drilling discharges also would be concentrated on less mobile benthic species.

Commercial and recreational fishing could suffer unavoidable adverse impacts directly from oil spills, seismic operations, increased vessel traffic platform siting and indirectly from any action that negatively impacts target species (see above). Oil spills could foul boats and gear, making them unusable, or could preclude fishing areas. Towed seismic arrays could also foul gear. Increased OCS-related vessel traffic could hinder fishing operations, result in an at-sea collision which could disable fishing vessels, or complete for beathing space in ports and harbor Platform location could interfere with travel routes.

Unavoidable adverse impacts could occur to marine mammals and coastal and marine birds due to accidental oil spills. Threatened and endangered species could be more significantly affected due to their already stressed population levels. Noise from OCS activities are likely to cause minor adverse impacts to cetaceaus.

Air quality in the immediate vicinity of an OCS oil and/or gas activity will be unavoidably affected. Emissions from internal combustion engines, turbines, leaky valves, etc., will degrade air quality near drill ships, platforms, pipelaying barges, refineries, and gas processing facilities.

Unavoidable adverse impacts to recreation could occur through beach closure if a spill hit shore during a tourist season. Oil spills could temporarily close marines and boat launching facilities adversely affecting sportfishing, and boating.

Visual resources will suffer unavoidable adverse impacts due to platform contruction on the OCS. Scenic areas will be visually degraded but the extent of degradation is dependent upon the placement of platforms. Visual adverse impacts will last the lifetime of the projected OCS oil and gas activities.

c. Relationship Between Short-Term Uses of Man's Environment and Long-Term Productivity

The proposal is expected to have a 30-year lifetime at minimum. Activities which precede the proposal, have a lifetime exceeding the termination of oil and gas activities, and which affect long-term productivity locally and regionally are water supply, recreation, land use, coastal ecosystems, commercial fisheries, and endangered and threatened species.

OCS development will increase the demand for water services. In areas where demand exceedes supply, OCS development could result in short-term scarcities, Long-Term productivity may be limited if the capacity of the water service systems can not be expanded to meet demand.

Recreation will suffer minor, localized short-term impacts due to the removal of coastal locations from recreational use for the duration of the project. Marine vessels associated with OCS activities may conflict with recreational and commercial fishing boats for berthing space, use of port and harbor facilities, and operating areas.

Coastal ecosystems are likely to suffer short-term impacts to productivity during various phases of OCS activity. These impacts could translate into long-term impacts on fisheries production and productivity of sensitive marine habitats. With the cessation of oil and gas activities, the marine environment is generally expected to return to previous levels.

The long-term effects of platforms and other OCS-related structures on commercial fisheries is not known, however no long-term adverse impacts on sports fisheries are expected. Platforms left in place after production stops could continue to function as either an artificial reef or an impediment to commercial fishing, especially traveling.

OCS development will increase the demand for land. Short-term impacts to the human environment would include construction activity to develop land to support OCS development, the possible displacement of non OCS related development, and induced land use impacts resulting from OCS related population increases, long-term productivity of the land will not be affected. Open space, residential, industrial, or commercial land uses, are all productive land uses.

Coastal ecosystems are likely to suffer short-term impacts to productivity during various phases of OCS activity. These impacts could translate into long-term impacts on fisheries production and long-term impacts in productivity of sensitive marine habitats such as estuaries and shallow offshore reef areas. With the cessation of oil and gas activities, the marine environment is generally expected to return to its normal long-term productivity levels.

d. Irreversible and Irretrievable Commitment of Resources

The proposal to lease in Northern California does not by itself result in the irreversible and irretrievable commitment of any resource. However, if oil and gas resources are explored, found and developed, the proposal is expected to result in the eventual irreversible and irretrievable commitment of 58 million barrels of oil and 1043 billion cubic feet of gas since, once these resources are produced and used, they will not be available for use at a future time.

Cultural resources in the Northern California OCS is another resource that may suffer irreversible commitments of the resource if the proposal is adopted. Destruction or disturbance of a cultural resource site either by construction or by scientific exploration is permanent. The value of a site is lost to a very large extent if disturbed even if relics are subsequently recovered.

Migrating cetaceans, especially gray whales, may suffer irreversible impacts if the acceleration of OCS activities within its range causes or contributes to a shift away from current migration routes to less favorable migratory passages.

e. Impacts of a High Case Scenario

The estimated "High Case" hydrocarbon resources for the northern California planning area are, 420 million barrels of oil and 1,860 billion cubic feet of gas. Infrastructure expected to be used to explore and develop these resources includes 33 exploration and delineation wells, 88 development wells, and 3 platforms. Although this is a considerable change in resource estimates from the "Base Case" (231 million bbls of oil and 1,023 BCF of Gas 20 exploration and delineation wells, 48 development wells, and 2 platforms). The resource estimates and development scenarios for the high case are identical to thoses for the cumulative case. The number of oil spills assumed in the high case analysis is one (0.69) which is identical to the assumption used in the cumulative case analysis. Therefore, because of the identical potential impacting agents assumptions used in both the high case analysis and cumulative case analysis, the expected impacts of the high case are identical to the expected impacts of the cumulative case.

f. Impacts of Alternative II - Subarea deferrals

Selection of Alternative II would result in the deferral of all blocks in the Northern California planning area seaward of the area of hydrocarbon potential. (See figure II.A.2.a-9).

The deferral of this subarea would have no noticeable effect on the potential impact resulting from oil and gas development off Northern California. Impacts are the same as described in Alternative I. It is likely that deferral of this subarea would have no affect on the likelihood of occurrence of an oil spill.

The deletion of the area would reduce potential localized water quality and visual impacts by precluding the placement of drilling rigs within the subarea.

g. Impacts of Alternative III - Add a sale in the Straits of Florida

The impacts from this alternative in the Northern California planning area are the same as described in Alternative I, since adding a sale in the straits of Florida planning area to the 5-year schedule would have no environmental implications in this planning area.

h. Impacts of Alternative IV - Biennial Leasing

This alternative would provide for scheduling biennial sales in the Northern California Planning Area. Under the proposal (Alternative I) two sales would be scheduled for the Northern California planning area (one in 1988 and another in 1991). The number of sales would remain the same for this alternative. However, the timing would change moving the sale scheduled for 1991 up one year to 1990.

Estimated hydrocarbon resources for Alternative IV in the Northern California planning area remain the same as for Alternative I: 231 million barrels of oil and 1,023 billion cubic feet of gas. Infrastructure expected to be used to explore and develop these resources includes 20 exploration and delineation wells, 48 development wells, and 2 platforms, remain the same as well.

The number of oil spills and the probability of one or more spills over 1,000 barrels is not expected to change for the planning area. Therefore, impacts for Alternative IV are expected to remain the same as Alternative I.

i. Impacts of Alternative V - Acceleration Provision

This alternative would provide the flexibility to permit the acceleration of leasing from triennial to biennial sales under certain defined criteria (see Chapter II.A.5. for a detailed discussion of this Alternative). However, no lease sales would be added to the schedule. The two lease sales for the Northern California planning area will remain. However, the first lease sale identified for 1988 would remain in 1988 and the second sale would move from 1991 to 1990.

Estimated hydrocarbon resources for Alternative V in the northern California planning area remain the same as for Alternative I: 231 million barrels of oil and 1,023 billion cubic feet of gas. Infrastructure expected to be used to explore and develop these resources remain the same as well: 20 exploration and delineation wells, 48 development wells, and 2 platforms.

The number of oil spills remains the same as the proposal, and the probability of one or more spills over 1,000 barrels is not expected to change for the planning area. Therefore, impacts for Alternative V are expected to remain the same as Alternative I, except that any potential impact producing factors resulting from the second sale would be present in the planning area up to 1 year earlier.

j. Impacts of Alternative VI - Defer Leasing in Six Planning Areas: North Atlantic, Washington and Oregon, Northern California, Central California, Southern California, and North Aleutian Basin

Selection of Alternative VI would defer leasing in all planning areas of the Pacific Outer Continental Shelf. The impacts resulting from this alternative would be the same as described for Alternative VII (No action) for the Northern California planning area.

k. Impacts of Alternative VII - No Action

Under this alternative, the Secretary of the Interior proposes not to schedule any oil and gas lease sales for this proposed 5 year program. All potential impacts to the physical, biological, and socioeconomic environment resulting from hydrocarbon exploration, development, and production would be eliminated.

Oil and gas are currently the nation's primary energy source. Even with a vigorous conservation program the United States demand for energy will continue to grow. With the adoption of Alternative VII the oil and gas that would have been available as a result of this proposed program would no longer contribute to the national domestic production during the life of the program.

With the removal of the potential oil and gas into the national energy reserves, it would necessitate the increased production of energy from other conventional and non-conventional energy sources (See Appendix C), and/or increases in import levels from foreign sources. Impacts resulting from the development of the alternative energy sources is discussed in Appendix C. and summarized in Section II.A.7.

Alternative VII would eliminate the contribution, from the Northern California planning area, of 231 million barrels of oil and 1,023 BCF of gas to the domestic energy production. The energy potential of this quantity of oil and gas would have to be replaced by alternative energy sources. Impacts resulting from the exploration, development, and production of the resources estimated for this planning area would be eliminated.

However, changes to the environment resulting from other projects which are planned for or are currently existing in the planning area could be expected to occur. Several of these are listed in Section IV.B.8.a.(1).

9. Central California

a. Alternative 1

The proposal includes holding one sale in the Central California planning area. It is estimated that the sale will produce about 207 million barrels of oil and 292 billion cubic feet of gas over a 35-year period. Approximately 11 exploration wells will be drilled. These resources will be produced from 30 production wells from 1 platform. In addition to the oil and gas, about 155.2 mbbls of firmation water will be produced. Approximately 185,000 bbls of muds and cuttings could be discharged into the sea over the life of the proposal. It is anticipated that one new support base would be required.

(1) Interrelationship of Proposal with Other Projects and Proposals

(a) National Parks and Sanctuaries

The purpose of the marine sanctuaries program (Title III of the Marine Protection, Research and Sanctuaries Act of 1972), as amended (16 U.S.C. 1431-1434) is to identify areas that are distinctive for their conservation, recreational, ecological, or aesthetic values, and to preserve and restore such areas by designating them as marine sanctuaries. The primary emphasis of the program is the protection of natural and biological resources. Multiple use activities are allowed within a sanctuary to the extent that the activities are compatible with the purpose for which the sanctuary was established. This program is conducted in close cooperation with other Federal and state programs.

Point Reyes - Farallon Islands National Marine Sanctuary:

The Point Reyes-Farallon Islands National Marine Sanctuary is the only national marine sanctuary in the Central California Planning Area. The boundaries of the marine sanctuary are officially defined as follows:

> "The National Marine Sanctuary consists of an area of the waters adjacent to the coast of California north and south of the Point Reyes Headlands, between Bodega Head and Rocky Point and the Farallon Islands (including Noonday Rock), and includes approximately 948 square nautical miles. The shoreward boundary follows the mean high tide line and the seaward limit of Point Reyes National Seashore. Between Bodega Head and Point Reyes Headlands, the Sanctuary extends seaward 3 nm beyond State waters. The Sanctuary also includes the waters within 12 nm of the Farallon Islands, and between the Islands and the mainland from Point Reyes Headlands to Rocky Point. The Sanctuary includes Bodega Bay, but not Bodega Harbor."

The purpose for designating the Point Reyes-Farallon Islands area as a marine sanctuary was to protect and preserve the extraordinary ecosystem, including marine birds, mammals and other natural resources of the waters surrounding these areas (see Section III.C.9.b.), and to ensure the continued availability of the area as a research and recreational resource.

Except as may be necessary for national defense the following activities are prohibited: (1) hydrocarbon operations; (2) discharge of substances; (3) alteration or construction on the seabed; (4) operation of vessels; (5) disturbing marine mammals and birds; and, (6) removing or damaging historical or cultural resources.

Hydrocarbon exploration, development and production are prohibited except that pipelines related to operations outside the Sanctuary may be placed at a distance greater than 2 nmi from the Farallon Islands, Bolinas Lagoon and Areas of Special Biological Significance where certified to have no significant effect on sanctuary resources.

A listing of the prohibited activities and any exceptions can be found in 15 CFR 936.6.

Cordell Bank Proposed National Marine Sanctuary:

Status: The Cordell Bank National Marine Sanctuary is presently proposed. National Oceanic and Atmospheric Administration (NOAA) is in the process of preparing a final EIS on the designation of this area as a National Marine Sanctuary.

> "Cordell Bank is a large undersea elevation lying 20 miles due west of Pt. Reyes, California, or about 50 miles northwest of San Francisco. It is located on the extreme edge of the outer continental shelf, in a line with the Farallon Islands, Noonday Rock, Fanny Shoal and another unnamed small bank. Due to its unique position, the Bank supports an exceptionally lush and healthy community of marine organisms, including algae, invertebrates, fish, birds and mammals. There is no land above the water surface; minimum depth known as of December 1981 is 35 meters (m) (114 feet). Principal landfalls are Ross Mountain, Mt. St. Helena, the head at Pt. Reyes, Mt. Tamalpais, and the Farallon Islands, although it is rare that all these are visible from the Bank."

Point Reyes Wilderness Area:

The Point Reyes-Wilderness Area is the only wilderness area in the Central California Planning Area. The boundary of wilderness area extends from the mouth of Tomales Bay to the Point Reyes Bird Observatory.

The Outer Continental Shelf Lands Act, as amended, prohibits the issuance of any leases or permits within 15 statute miles of the boundaries of the Point Reyes Wilderness unless the State of California allows exploration, development.

(b) Oil and Gas Sanctuaries

The California Oil and Gas Sanctuaries are specifically excluded from oil and gas leasing. For a discussion on the program see Section IV.B.8.a.(1)(a).

The State of California has designated the following areas as oil and gas sanctuaries located adjacent to the Central California Planning Area (PRC 6871.2(d) and (f)):

a) All those tide and submerged lands being in the Counties of Monterey and Santa Cruz . . . .

b) Until January 1, 1995, all those tide or submerged lands situated in San Mateo, San Francisco, Marin, Sonoma, Napa, Alameda, Santa Clara, and Del Norte Counties, and all those tide and submerged lands situated in Solano and Contra Costa Counties except those situated east of the parallel Carquinez Bridges (Interstate 80).

(c) Coastal Zone Management

The California coastal plan was completed in December 1975. This plan grew out of the 1972 Coastal Initiative (Proposition 20) which was adopted by the people of California. For a complete discussion on California's Coastal Zone Management Plan see Section IV.B.8.a.(1)(c).

(d) Ocean Dumping

Off the coast of Central California are a variety of historic and active dump sites (see Table IV.B.9.a.(1)(d)-1). For a discussion of the various different types of dump sites see Section IV.B.7.a.(1)(d).

(e) Memorandum of Agreement Between the Department of Defense and the Department of the Interior on Mutual Concerns on the Outer Continental Shelf

On July 20, 1983 the Secretary of the Interior and the Secretary of Defense agreed to establish procedures for joint use of the Outer Continental Shelf. For a more detailed discussion in the Memorandum of Agreement see Section IV.B.10.a.(1)(e). Also see Section III.C.10.c.(7) for a discussion of military use areas.

(2) Projects Considered in Cumulative Impact Assessment

(a) Oil and Gas Activities

On May 1, 1963, the first Federal OCS oil and gas lease sale on the Pacific Coast was held. To avoid conflicts with San Francisco Bay shipping, no blocks between San Francisco and the Farallon Islands were offered. Twenty-four tracts were leased in the San Francisco area. In the San Francisco area, all leases except the two in the Ano Nuevo basin carried stipulations regarding the Point Reyes National Seashore area. Drilling was not allowed on portions of four leases in the Bodega basin owing to shipping considerations.

Ten wells were drilled in the Bodega Basin and two wells were drilled in the Ano Nuevo basin. All leases were relinquished by June 14, 1968. For a complete discussion of the history of the POCS Lease Sales see the Pacific Summary Report April 1985 (MMS, 1985).

TABLE IV.B.9.a.(1)(d)-1

CENTRAL CALIFORNIA DESIGNATED DUMP SITES

Location		Depth	Content or Designated Waste
3815'N 12323'W	Bodega Bay	200 M	Dredge Spoil
3804'N 12216'W	Carquinez Straits	42 Ft	Dredge Spoil
3803'N 12205'W	Suisun Bay	30 Ft	Dredge Spoil
3800'N 12225'W	San Pablo Bay	39 Ft	Dredge Spoil
3749'N 12225'W	Alcatraz Island	130 Ft	Dredge Spoil
3747'N 12232'W	San Francisco	16 M	Dredge Spoil
3747'N 12233'W	Seal Rock	65 Ft	Construction Material
3746'N 12238'W	San Francisco	36 Ft	Dredge Spoil
3745'N 12236'W	San Francisco Channel/Bar	50 Ft	Dredge Spoil
3745'N 12236'W	San Francisco Bar		Dredge Spoil
3742'N 12240'W	San Francisco	36 M	Industrial Waste
3740'N 12325'W	San Francisco	2400 M	Explosive & Toxic Chemical Ammunition Chase I
3738'N 12308'W	Farallon Islands	900 M	Low Level Radioactive Waste
3737'N 12317'W	Farallon Islands	1700 M	Low Level Radioactive Waste
3735'N 12251'W	San Francisco	90 M	Industrial Waste
3735'N 12250'W	San Francisco	85 M	Cannery Waste
3732'N 12259'W	Farallon Islands		Dredge Spoil
3725'N 12530'W	San Francisco	4800 M	Explosive & Toxic Chemical Ammunition
3710'N 12323'W	Pigeon Point	3518 M	Explosive & Toxic Chemical Ammunition
3700'N 12400'W	Pigeon Point	3822 M	Explosive & Toxic Chemical Ammunition

Table IV.B.9.a.(1)(d)-1 (continued)

Location		Depth	Content of Designated Waste
3649'N 12150'W	Moss Landing	20 M	Dredge Spoil
3648'N 12147'W	Moss Landing	48 Ft	Dredge Spoil
3648'N 12149'W	Moss Landing	200 M	Dredge Spoil
3642'N 12202'W	Monterey Bay	2000 M	Dredge Spoil
3622'N 12530'W	Point Sur	4960 M	Explosive & Toxic Chemical Ammunition
3600'N 12337'W	Point Sur	4000 M	Explosive & Toxic Chemical Ammunition
3740'N 12450'W			Low Level Radioactive Waste (not used)
3600'N 12400'W			Low Level Radioactive Waste (not used)

Source: MMS Files, 1985

(b) Oil and Gas Infrastructure

The majority of existing oil and gas infrastructure in Central California are support for oil and gas development from Alaska and Southern California.

(i) Refineries

At the refineries crude oil undergoes several processing stages, including separation, conversion and treatment. Refineries range in size from small plants capable of processing only 190 barrels of crude per day to complex facilities which process more than 500,000 barrels per day. For a list of the refineries and their capacities see Table IV.B.9.a.(2)(b)-1.

(ii) Platform Fabrication Yards

Kaiser Steel owns two fabrication facilities in Napa and Fontana and two assembly yards in Oakland and Vallejo. The Kaiser operations in Vallejo and Napa were where the fabrication of the Eureka jacket for Shell Oil Company occurred. Fabrication bids are expected for several platforms including ARCO's Heron A and B, Shell Oil's Molino Point platform in State Waters, and Sun Gas's platform for the Tricia prospect in the Santa Maria Basin (MMS, 1985).

Marine Terminals

There are five marine terminals in the San Francisco Bay area: San Francisco, Oakland, Benicia, Richmond and Redwood City.

(3) Physical Environment

(a) Impact on Water Quality

Water quality in the Central California OCS would be impacted by a variety of liquid and solid wastes that are associated with offshore oil and gas exploration and development. These wastes were characterized and their general impacts on water quality were described in Section IV.B.7.a.(3)(a).

The primary impact producing agents that affect water quality that are associated with the proposal include 1) drill muds and cuttings 2) produced water, 3) sediment resuspension, and 4) accidental oil spills. The remaining discharges and leachable materials mentioned above are of secondary and minor importance because of their small volume, small concentration or temporary occurence. Domestic and sanitary wastes are treated by an activated sludge system and are chlorinated before discharge. Effects from such domestic and sanitary waste discharges can not be measured a few meters from their discharge point and are, therefore, negligible.

An estimated 185,000 bbls of drill muds and cuttings would be discharged from the proposed central California development. Mixing and dilution of the discharge plume from each platform would depend on the rate of discharge, discharge depth, and existing hydrographic conditions.

TABLE IV.B.9.a.(2)(b)-1

REFINERIES PROCESSING OFFSHORE OIL CENTRAL CALIFORNIA PLANNING AREA

Refinery Location	Operating Crude Oil Capacity (bpcd)
Chevron U.S.A. Inc. - Richmond	365,000
Exxon Co. USA - Benicia	109,000
Pacific Refining Co. Inc. - Hercules	55,000
Tosco Corp. - Martinez	126,000
Union Oil Co. of California - Rodeo	111,000

Source: MMS, 1985.

Dilutions of 1,000-fold are expected within several meters of each discharge and very low concentrations are expected within 2,000 meters downcurrent [see Section IV.B.7.a.(3)(a)]. Localized turbidity from the plumes would reduce light penetration and, therefore, photosynthesis. Solids may accumulate on the bottom beneath the discharge plume and bury sessile benthic organisms directly or cause changes in sediment characteristics and subsequently result in changes in the benthic community. Acute toxicity from the drilling muds and cuttings is not expected because of rapid mixing, and because drilling fluids have low toxicity (Neff 1985). Chronic or sublethal effects may include bioaccumulation of metals by some organisms, but such effects are poorly understood. Long-term effects (e.g., changes in behavior, metabolism or reproduction), if any, would be restricted to areas near the platforms. Overall, moderate impacts from drilling muds and cuttings are expected at the platforms, while regional impacts will be low.

A total of about 155 mbbls of produced water containing particulate matter, hydrocarbons, dissolved inorganic ions and metals, with characteristically low dissolved oxygen, low pH and high salinity, would be discharged from the development platforms. These discharges pose little threat to the marine environment. Numerous studies (summarized in Boesch and Robalais 1985) suggest that produced waters are virtually non-toxic. Although field work indicates the potential for bicaccumulation of petroleum hydrocarbons from undiluted produced waters, mixing and dilution would be very rapid after discharge and organisms would be little affected. Impacts from produced waters are considered to be low for the region, but adjacent to the platforms, impacts will be moderate because of measurable increases in trace metals and dissolved hydrocarbons.

Bottom sediments will be disturbed during exploration and development activities associated with platform and pipeline installation. Sediment resuspension will cause turbidity plumes and result in reduced sunlight penetration and a decrease in phytoplankton growth if the turbid water occurs in shallow waters (i.e., <100 meters). Some sessile organisms will be buried directly, especially during pipeline trenching when relatively large quantities of sediment will be displaced. Resuspended sediment that was previously polluted with hydrocarbons, metals or pesticides might be a source of contamination for organisms exposed to the sidiment plume. Impacts associated with sediment resuspension are short-term, localized and are considered low impacts.

There is a chance of one accidental spill of oil exceeding 1000 bbls (probability 35%) as a result of the proposal. As indicated in Section IV.B.7.a.(3)(a), the fate and effects on water quality of a spill depend upon a number of factors including the spill's size, location, proximity to shore, season, and sea and weather conditions. In the open ocean and in moderate to high seas, a spill is rapidly dispersed and "weathered" by physical and biological processes such as evaporation, oxidation, emulsification, and uptake and metabolism by marine organisms. Over deep waters, some components of the oil would eventually reach bottom sediments in low concentrations, and potentially over a wide area. Spilled oil might persist for long periods if the oil residues reached shore and were driven into beach sands or estuarine sediments and were subsequently covered and uncovered during normal tidal exchange. Degradation in water quality could range from a moderate impact for a small spill in the open ocean to a very high impact for a large spill. Any oil which entered relatively calm waters of enclosed bays and estuaries would result in high impacts. An oil spill could have very high impacts if the oil became entrained in calm bays and estuaries such as Tomales Bay where it might persist for many months. The most significant effects on central California ocean water quality from the proposed project will be from discharges of muds and cuttings, produced waters and from sediment resuspension. Plankton exposed to discharge and sediment plumes will be temporarily affected. Benthic communities are likely to change as a result of altered sediment parameters (i.e., grain size) or burial by sediments or muds and cuttings solids. Acute mortality of marine organisms from platform discharges or sediment resuspension is not expected because of relatively low toxioity and rapid mixing and dilution of all discharges. Some marine organisms are expected to incorporate some metals and hydrocarbons into their tissues, which may result in subtle reproductive, metabolic and biochemical changes of unknown significance.

CONCLUSION: Overall, low to moderate impacts are expected from the project but these effects would be limited to relatively small, localized areas adjacent to the platforms and pipeline routes and downstream of platform discharges.

CUMULATIVE IMPACTS: Water quality for most of the central California planning region is very good, but exceptions occur within San Francisco and Monterey Bays where municipal wastes, industrial wastes, and general port activities have degraded water quality. Drilling muds and cuttings, formation water, and resuspended sediments from the proposed OCS activities will cause moderate impacts. Cumulative impacts on water quality would include the cumulative effects of 3 platforms, including their associated operational discharges, and one oil spill. An estimated 530,000 bbls of muds and cuttings and 480 MMbbls of formation waters would be discharged during the lifetime of potential oil and gas development off central California. The total number of oil spills assumed from all sources would be 1, and the chances of at least one spill occuring is estimated to be 98%.

Municipal wastewater and harbor activities are the major causes of water quality degradation and are the primary source of toxicants to central California ocean waters. Significant degradation of water quality and marine communities is confined to areas in San Franciso and Monterey Bays and the surrouding open coast; overall water quality for the central California area is very good.

CONCLUSION: Discharges associated with potential oil and gas development will degrade water quality in additional small areas, and localized impacts may be moderate. On a regional basis, however, cumulative impacts will be low. The impact to water quality of potential oil spills is considered to be low to moderate.

(b) Impacts on Air Quality

Air quality impacts are estimated based on the discussion presented in Section IV.B.7.a.(3)(b). Exploratory drilling operations would result in a temporary emission source for a limited duration in any one area. Emissions would primarily consist of nitrogen oxides. Pollutants drifting onshore would be very localized, and concentrations would be below DOI Significance Levels. Onshore air quality would therefore not be significantly affected.

Development and production activities associated with the one platform projected for the planning area would result in small, localized increases in air pollutant concentrations. These concentrations would be below the DOI Significance Levels. Development and production activities also would not cause any significant increase in ozone concentrations. Photo-chemical trajectory modeling performed for emissions from a production platform in the proposed project area indicated no significant increase in ozone levels under worst-case meterological conditions assuming hydrocarbon emissions associated with tanker loading operations are fully controlled (FSI, 1983).

Air emissions would also be associated with tanker unloading operations in the San Francisco Bay area. This area is presently classified nonattainment for ozone and carbon monoxide. Tankers operating in the area would be subject to emission controls as prescribed by the local air quality regulatory agency. The most significant source of air emissions, the release of hydrocarbon vapors during unloading, can be minimized by the use of vapor recovery systems and the use of segregated ballast. Tanker operations would not be expected to significantly affect air quality. Some emissions may also be expected from onshore gas processing, crude oil storage, oil treatment facilities, and refineries. It is difficult to predict emissions from refineries, since it would involve possible modifications of existing facilities. However, project emissions are not expected to result in any significant change in onshore air quality.
Impacts on air quality from the one platform assumed to result from the proposed action would be low. See Appendix A for a complete list of air quality impact level definitions.

CONCLUSION: The proposed project would not significantly affect onshore air quality. Impacts on air quality would be low.

CUMULATIVE IMPACTS: Impacts on air quality were considered by including all other future projected offshore and onshore projects. Offshore development in this case would include two additional production platforms. Total offshore emissions would be greater because of a greater production rate. However, since the platforms are likely to be spaced considerable distances apart, maximum air pollutant concentrations would not differ significantly from those associated with an individual platform. For platforms located near shore, average annual concentrations of nitrogen oxides could slightly exceed the DOI Significance Levels. These facilities would be required to install pollution controls. Possible control measures for equipment on production platforms include water injection on gas turbines, fuel injection retard on diesel engines, selective catalytic reduction, and waste heat recovery.

Emissions from onshore gas processing facilities, tanker unloading operations, and oil storage facilities, and refineries can be adequately controlled so as to prevent any significant impacts on air quality. These emission controls are routinely required by the local air quality regulatory agencies.

Air quality impacts from cumulative development in the proposed project area would be low.

CONCLUSION: The cumulative impacts in the planning area would be low.

(4) Biological Environment

(a) Impacts on Plankton

The impact on phytoplankton and zooplankton in the lease sale region will come from drilling muds, formation water (if it is discharged) sewage, and spilled hydrocarbons. These agents and their effects on plankton have been discussed further in Section. IV.V.7.a.(4)(a) of this document. The deleterious effects of oil and gas activity on plankton populations, especially oil spills, is felt to be nonsignificant, due to the spatial and temporal variability of plankton in the marine environment.

The impacts caused by the 11 exploratory wells and 30 development/production wells on a single platform would be very low and occur only within the water packets impenetrated by drilling muds, formation waters, sewage and small oil spills. The probability of one or more large (1,000 bbl or greater) spills occurring is 35 percent. Should a large spill occur, impacts to plankton would be low within the water mass contacted by the spill. The overall impact to the plankton population would be negelable. If the large spill becomes trapped within an eddy system, locally impacts would be moderate.

CONCLUSION: Impacts to plankton from the proposed action will be low locally within any water mass affected, but very low planning area-wide.

CUMULATIVE IMPACTS: The total number of large (1,000 bbl or greater) spills from all future, past and present oil activities is assumed to be 5 (4.48) with a 98 percent probability of one or more spills occurring. Impacts to the plankton population of the area would remain very low even if the oil spills occurred a few months apart because impacts would be limited to the water packets impacted by oil. The same would be true with impacts caused by the three platforms predicted. Impacts would remain very low since the plankton would be limited to relatively small water packets within which muds are entrained.

CONCLUSION: Cumulative impacts would be very low for the planning area.

(b) Impacts on Benthos

(i) Intertidal

Impacts on intertidal communities could be caused by oil spills from platforms or tankers and the installation of pipelines. Drilling platforms and related activities are not expected to cause impacts to intertidal communities because they are three or more miles away. During pipeline installation, damage to the communities within an area about 20 m wide would occur where the pipelines come ashore. Recovery from this type of disturbance should proceed normally within 2 years and with no toxic residues left in the area from the operation. Further analysis of oil development impacts on intertidal communities can be found in BLM (1975, 1979, and 1980) and National Academy of Science (1975).

Impacts from a large oil spill would cause mortality to rocky shore intertidal organisms from smothering. Toxic related mortality is also possible, particularly if oil were to reach shore in a matter of hours.

During the 1969 Santa Barbara oil spill, certain species experienced mortality of up to 100 percent while other species experienced noticeable mortalities, were harmed only slightly or were apparently unharmed (Straughan, 1979; Foster, 1974; Foster, et al., 1971). The extent of damage from oil spills depends largely on the residence time of the oil on the impact intertidal area (Grundslach and Hayes, 1979). Residence time on steeply inclined intertidal areas will be brief and impacts consequently will be short term with insignificant interference with ecological relationships lasting less than a year. Broad flat intertidal surfaces could retain oil for several days. The length of residence time on flat or gentle sloping intertidal surfaces will depend upon tidal height and whether or not the oil is moved away from the impacted area during high tide cycles. Oil impacting flat broad intertidal platforms and shallow tide pools will usually cause significant interference with ecological relationships that will last for less than 2 years.

The length of the recovery period of the damaged intertidal communities to a predisturbance condition will depend upon the vertical level of the intertidal zone effected (Murray and Littler, 1979 and 1980). The upper barnacle zone should require the least time to recover (approximately 1-year). The more structurally-complex middle and lower-levels would require the greatest time for recovery. These structurally complex communities which have been established for a fairly long time have many species which live for long periods. The life expectancies of only a few species have been reported in the literature (Vesco and Gillard, 1980). The majority of macroinvertebrates which have been investigated have life potentials of over 5 years. In the lower tidal communities, interrelationships have been established which are thought to be the primary factor controlling the composition of the community (Carefoot, 1977). Such communities require a long time to recover if they are severely altered. Recovery times for communities within these areas will vary from over 1-year for certain seaweed for up to 10 years for a muscle bed. However, mussels communities have not suffered apparent significant mortality during oil spills (Chan, 1975).

Mineral Management Service is funding a study to test latitudinal differences in rocky intertidal community recovery times in central and northern California. In theory, recovery should take a little longer in northern California because of colder annual water temperatures.

Most rocky intertidal areas would be expected to begin recovery within a year after the disturbance, and reproductive maturity achieved within 5 years. Isolated locations which have been heavily affected could be retarded in recovery for possibly a year because larvae and spores from impacted species would have to come from areas outside the impacted area rather than from within it. This condition is particularly true of the brown algae which have limited dispersal abilities. Once repopulation commences, recovery would proceed normally, although other dominant species could out compete the original species as a result of advantageous settling times.

Table III.C.3.b.(2)-1 lists rocky intertidal areas in central California which are believed to be more sensitive to oil spill impacts than other areas of the coast. The selection of these areas was based upon their having broad flat rocky platforms, isolation from other rocky intertidal areas, biogeographic location, and potential or past scientific study history.

In most areas, the extent of damage to a sandy beach intertidal community from a large oil spill will be less than that to a rocky community. The extent of the damage is unknown but is generally not expected to be the complete destruction of a community. The impact from oil spills largely depends upon the residence time of the oil on the intertidal habitat. At one extreme, on open coasts receiving large high energy waves, the residence time will be brief and impacts low. At the other extreme, the residence time of oil on intertidal habitats of estuaries which usually have very small waves will be long and impacts high. Estuaries are covered in Section IV.B.9.a.(4)(g). If oil is retained on a sandy intertidal beach for long periods, community members, such as clams, may suffer a high ecological loss.

Indirect damage could result from the cleanup operations following a large oil spill. These activities could result in the total destruction of local sandy beach intertidal communities when sand is removed at recreationally important beaches. However, recovery from this type of impact would occur normally.

The probability of a large (1,000 bbl or greater) spill occurring is 35 percent indicating a spill could occur. Should a large oil spill occur and contact a rocky intertidal habit, the impacts will vary from moderate for the areas listed in Table III.C.8.b(2)-1 as being more sensitive than the norm to low. Impacts would be local, the planning area would not be altered overall.

Impacts to sandy beach intertidal areas from a large oil spill would vary from low for gently sloping beaches to very low.

CONCLUSION: Intertidal areas will not experience impacts from normal production. Impacts from oil spills are expected to be low locally and very low regionally.

CUMULATIVE IMPACTS: The total number of large (1,000 bbl or greater) spills from all future, past and present oil activities is assumed to be 5 (4.48) with a 98 percent probability of one or more large spills occurring.

The impacts from a large oil spill reaching intertidal areas would remain low for most rocky intertidal and some sandy beach areas and moderate for more sensitive rocky intertidal areas. If two or more spills were to contact a rocky intertidal area on consecutive or alternate years, the impact would be very high. This essentially means that recovery would require over 10 years. Although the probability of such an occurrence is unknown, it is believed to be unlikely.

CONCLUSION: The impacts from a large oil spills would be low locally and very low regionally.

(ii) Subtidal

Activities which may adversely impact subtidal dwelling organisms include: emplacement of drilling platforms, discharge of drill cuttings and muds, pipeline construction, and oil spills. For a discussion of these generic impacts refer to Sections IV.B.10.a.(4)(b) of this EIS.

For additional coverage of oil production related impacts on subtidal benthos, refer to BLM (1975, 1979, and 1980) and MMS (1983a, 1983b).

Little information is available on the bottom communities of the region, but it is resonable to assume that they are productive and diverse owing to the indirect evidence of abundant upwelling and high fisheries landings. The one area which has been identified as being potentially sensitive to normal oil production activities is Cordel Bank off San Francisco. This hard bottom area has a rich community including "purple coral" Allopora California.

The impacts caused by the 11 exploratory wells and 30 development/production wells on a single platform would be very low for nearly all exploratory wells and very high in the immediate vicinity of the production platforms. The life expectancy of production platforms is 20 years and the combined drilling and platform impacts referred to above and summarized in Section IV.B.10.a.(4)(b) should last at least for the duration of the platform.

The probability of a large (1,000 bbl or greater) spill occurring is 35 percent. Should a large oil spill occur and contact a benthic community, the impacts would be low.

CONCLUSION: Subtidal benthic areas will sustain very high impacts immediately around the single production platform predicted for the planning area. Impacts from most of the 11 exploratory wells will be very low. Regionally, impacts are expected to be low.

CUMULATIVE IMPACTS: Impacts from three platforms rather than one will cause very high impacts immediately around the platforms. The impact on the ecology of the planning area would be negligible.

The total number of large (1,000 bbl or greater) spills from all future, past and present oil activities is assumed to be 5 (4.48) with a 98 percent probability of one or more large spills occurring. The potential impacts discussed above would remain the same (low), but the potential for such an event would increase.

CONCLUSION: Very high impacts will occur immediately around three platforms rather than one. Oil spill related impacts would remain low.

(c) Impacts on Fish Resources

Since the fish resources of this planning area are very similar to those of northern California, and to some extent Oregon and Washington, the general impacts to fishes discussed in sections IV.B.7.a(4)(c) and IV.B.8.a(4)(c) are also expected to be of concern in areas described in section.

Anticipated impacts to crab, salmon, rockfishes and nearshore and pelagic surface fishes, by the same logic and for the same reasons, are the same degree for central California as they are for northern California. Among other fishes, striped bass, though anadramous like salmon, are anticipated to suffer no worse than very low impacts from the small amounts of proposed OCS activity and oil spill potential. They likely will not be affected at all.

Squid populations in Monterey Bay could suffer a low to very low level of loss from the proposed plan, mostly due to local oil spills. Again, the low spill potential should keep impacts to a minimum.

CONCLUSION: The proposed action is expected to have a low level of impact on marine fish resources off central California, though localized impacts to certain species could be higher.

CUMULATIVE IMPACTS: Over a longer period of years, with further increased such as tankering of imported oil potential for oil and gas exploration and production, and potential for impacts from other sources (5 spills are assumed in the cumulative scenio) the impacts to fish resources could be moderate. Many species important to commercial and sport fisherman are currently stressed from fishing pressure and sewage disposed. The contribution of potential impacts from the proposal would be minor but significant.

CONCLUSION: Central California marine fish resources will incur a moderate level of impact.

(d) Impacts on Marine Mammals

Marine mammal species occupying the Central California Planning Area are similar to those described for northern California with two exceptions. Major concentrations of humpback whales occur in the Farallon Basin during summer and autumn, and the northern edge of the southern sea otter range begins at Point Ano Nuevo. Approximately one-quarter of the southern sea otter population occurs between this point and Point Sur. Potential impacts to these threatened and endangered species are discussed in the following section (e). The largest concentrations of marine mammals in this Planning Area are located on or near the Farallon Islands and at Ano Nuevo Point. Potential impacts to pinniped breeding colonies have been discussed previously. Noise and disturbance from vessel and air traffic are probably most likely to be the source of impacts from normal activities to breeding species. Disturbance of a breeding colony could cause locally moderate to high impacts to individual colonies. Impacts to breeding pinniped colonies can easily be avoided by careful placement of supply bases and routing of vessel and air traffic corridors. Both breeding and nonbreeding pinnipeds are expected to experience very low to neglible impacts from noises and discharges generated by the one platform expected from this proposal.

Most cetaceans occurring in the Planning Area will likely experience very low to low impacts from normal activities. Pacific White sided dolphins, northern right whale dolphins, Risso's dolphins, and Dall's porpoises, which occur in high densities late summer through early winter, could experience very low to neglible impacts from noise and disturbance and platform discharges. Cetaceans will probably experience low impacts due to noise and disturbance from seismic activities and vessel traffic. Gray whales, which have been reported in this area year round, and humpback whales are discussed in the following section (e). Platform discharges are expected to have neglible impacts on cetaceans.

Accidental events, such as an oil spill or vessel collision could cause locally moderate to high impacts to marine mammals. Over the life of the proposal, production of estimated 207 million barrels of oil reserves in central California are assumed to result in one spill greater than 1,000 barrels. The probability of one or more spills occurring is 35%. Of the pinnipeds, the fur seals are the most vulnerable to sustaining high ecological losses due to their sensitivity to oiling. This species is only found at sea and does not breed in this planning area. The Northern fur seals are the more likely of the pinnipeds to encounter an oil spill and suffer mortality due to its abundance at sea. Depending on the number of individuals making contact with oil, this species could experience locally moderate to high impacts. Other pinnipeds are less likely to experience mortalities if contacted with oil. However, breeding hair seals could experience locally high ecological losses if disturbed by cleanup and containment operations. Vessel collisions are considered rare events but could cause impacts to individual animals. Impacts to populations from potential vessel collisions would be very low to most species.

Accidental events, such as an oil spill or vessel collision could result in locally moderate to high impacts to most species. Due to the presence of breeding species in this area, impacts on a regional level could range from low to high.

CONCLUSION: Overall impacts to marine mammals from activities associated with this proposal are expected to be low.

CUMULATIVE IMPACTS: The cumulative impact of OCS activities associated with this proposal and other activities such as import tankering on marine mammals would probably have low to moderate levels of impact similar to, but greater than what is projected for the proposal. Cumulative scenario resource development assumes that three platforms are required to develop the resources. Potential impacts from normal oil and gas activities to marine mammals would probably increase slightly but remain very low. The expected number of oil spills greater than 1,000 barrels is assumed to be 5 with this scenario. The probablity of one or more spills is 98%. The increment of risk contributed by the proposal is considered low when compared to the cumulative estimate for five spills from all sources in this Planning Area. The probability oil from tankering being spilled in the vicinity of the breeding areas on the Farallon Islands and near Pt Reyes is high due to the proximity of San Francisco harbor. The Puerto Rican incident is evidence of the likelihood of this event. Multiple spills in the same area during the life of the proposal could elevate significant impacts at least one level due to the inability of a population to recover before a second event. The chances of two spills contacting the same area twice is very low.

With or without the proposal, some marine mammals are expected to suffer low to moderate impacts over the life of the proposal. Migrating species are subjected to stresses from municipal and industrial discharges and other human activities, including existing oil and gas operations throughout their migration. Although ocean waters off northern California are relatively clean, migrating species may suffer low level impacts and a general degradation of health is possible. Overall, impacts are expected to be regionally low to moderate and most species are expected to maintain viable populations.

CONCLUSION: The cumulative impacts from the proposed OCS lease sales in the Central California Planning Area combined with other OCS and non-OCS activities within the range of migrating marine mammals will have regionally low to locally moderate impacts on most species. The increment of risk of an accidental oil spill from this proposal is considered low in terms of existing risks from foreign and domestic tankering.

(e) Impacts to Coastal and Marine Birds

Coastal and marine birds nesting or migrating through the Central California Planning Area will be susceptible to the same impacts as those discussed for Oregon/Washington. Normal activities are expected to have low impacts to avian species, however, the potential exists for locally high impacts if activities occur near nesting areas. Noises and disturbances from air and vessel traffic are potentially the most threatening impacts to these birds. The most important nesting areas within this Planning Area are located on the Farallon Islands, on the mainland between Point Reyes and Point Montara and between Point Ano Nuevo and Monterey Bay. Nesting species which could be impacted by noise and disturbance include Cassin's auklet, Ashy storm-petrels, Brandt's cormorants, Common murres, and Western gulls. Although periods of high noise are expected to be brief, high impacts are still considered possible in some areas. Birds nesting within the boundaries of the Point Reyes/Farallon Islands Sanctuary are unlikely to be affected since oil and gas activites are not permitted within six miles of these shores. If care is taken to avoid disturbing known nesting areas, other areas along the coast may also be protected from sustaining impacts.

In addition to nesting species, shoreline and shelf avian populations are also dominated by sooty shearwaters, Brown pelicans and phalaropes while waters seaward of the shelf are dominated by storm petrels, auklets, phalaropes, sooty shearwaters and artic terns. Noise and disturbance are not likely to affect this species significantly. Very low impacts can be expected. Impacts to avian species from platform discharges are not understood and are considered uncertain.

Over the life of the proposal, production of the estimated 207 million barrels of oil are expected to result in one spill greater than 1,000 barrels. The probability of one or more spills occuring is estimated at 35%. If a spill were to contact a seabird rookery during the breeding season the nesting success of over 12 species, which include over half of California's breeding species, could be highly impacted. Many birds, especially murres and auklets, would perish due to oiling and hypthermia. Eggs could be contaminated from oiled adults. Impacts could reach high regional significance for some species. Mechanical cleanup equipment may be used to reduce oil impacts. Dispersants may be used to speed weathering of the oil and reduce impacts. Oil dispersants may, however, have more harmful effects on seabirds than the oil itself.

Non-nesting birds may also be impacted from a oil spill. Due to the large numbers of birds which forage over these waters, the potential exists for high impacts to some species. Impacts would be less significant to populations since birds are less concentrated over water than on land.

Accidental oil spills could result in moderate to high impacts to nesting species and low to moderate impacts to most migrating species.

CONCLUSION: Normal activities are expected to have low impacts to marine and coastal birds in this Planning Area.

DISCUSSION: The cumulative effect of OCS development activities and non OCS activities such as sewage disposal and tankering of oil imports on marine and coastal birds would probably have low to moderate levels of impact similar to but greater than what is projected for the proposal. Cumulative scenario resource development assumes that three platfroms are required to develop the resources. Potential impacts from normal activities to marine and coastal birds would probably increase but remain very low. Platform discharges are not expected to have effects on marine and coastal birds although prey species of some birds may be affected (see Fishes, Plankton). Overall, impacts are expected to remain very low from normal activities.

The expected number of oil spills greater than 1,000 barrels is five for the cumulative scenario. The corresponding probability of one or more spills occurring is 98%. This increment of risk contributed by the proposal is considered moderate in terms of the cumulative risk for oil spills from all sources in the Planning Area. Marine and coastal birds could experience locally high impacts if contacted with oil. The risk of oil from tankering being spilled in the vicinity of the Farallon Islands and Point Reyes is probably high due to the proximity of San Francisco harbor. Multiple spills in the same area during the life of the proposal could elevate significant impacts at least one level due to the inability of a population to recover before a second event. The chances of two spill contacting the same area twice are very low.

With or without the proposal, some coastal and marine birds are expected to suffer low to moderate impacts during the life of the proposal. Recent El Nino conditions have been blamed for significant declines in seabird breeding populations on the Farallon Islands. In addition, the Puerto Rican oil spill caused the death of over 2,000 seabirds. Migrating species are subjected to stresses from anthropogenic sources throughout the Pacific coast. Loss of habitat and human disturbance have been and will probably continue to be the most serious impacts to avian fauna. Most important breeding colonies off northern California are protected areas. Approximately one half of the entire California breeding population of seabirds occur within the Farallon Islands/Point Reyes Marine Sanctuary. Other important areas along the mainland are protected but have sustained recent heavy impacts due to commerical fishing activities. Several thousand birds have been reported to have perished in gillnets between Point Reyes and Half Moon Bay in recent years. Overall, impacts are expected to be regionally low to moderate and most species are expected to maintain viable populations.

CONCLUSION: The cumulative impacts from the proposed OCS and lease sales in the Central California Planning Area, combined with other OCS and non-OCS activities within the range of migrating birds will have low to moderate impacts to coastal and marine species.

(f) Impacts to Threatened and Endangered Species

Threatened and endangered species breeding or migrating through the Central California Planning Area will be susceptible to the same impact sources as discussed for Oregon/Washington. Potential impacts to marine mammals or marine and coastal birds have been discussed earlier. Specific impacts to species in Central California are discussed below. Although present in this Planning Area, the salt-marsh harvest mouse and Morro Bay kangaroo rat are not expected to be impacted by this proposal. Potential impacts to sea turtles are the same as discussed for Oregon/Washington.

A formal Section 7 Endangered Species Consultation of MMS with NMFS and the FWS was conducted for the proposed Northern and Central California planning area (Sale 73). The biological opinion from the FWS was dated June 8, 1983, and covered American peregrine falcon, bald eagle, brown pelican, California least tern, California clapper rail, light-footed clapper rail, Morro Bay kangaroo rat, salt marsh harvest mouse, southern sea otter, San Francisco garter snake, Santa Cruz long-toed salumander, Smith's blue butterfly, unmarked three spined stickleback, and salt marsh bird's beak, and the covered and angened and threatened whales. The biological opinion from NMFS is dated August 9, 1983.

See Chapter V for a further description of the Consultation process for Section 7 of the Endangered Species Act of 1973.

MMS prepared a request for information conccerning the proposed 5-Year OCS Oil and Gas Lease Sale Program. A response from the NMFS dated November 6, 1985, is included in Chapter V.

Brown Pelican: Normal activities are not likely to impact the brown pelican. This species forages and roosts throughout the Planning Area, but does not nest. The noise and disturbance from air and vessel traffic are expected to cause very low impacts to feeding and resting birds. Accidental oil spills could cause mortality of individual birds if contacted with oil. These birds are widely distributed through the area and would probably not suffer losses of large numbers of birds from a single spill. Impacts to brown pelicans from an accidental oil spill would probably be locally high, but regionally low to the species.

Peregrine Falcon: Normal activities are not likely to impact this species since peregrines are uncommon visitors to Central California waters. An accidental oil spill could cause locally moderate to high impacts to peregrines if important feeding habitats or prey were effected. Peregrines could become oiled if oiled prey were consumed. Loss of one of the estimated 50 breeding pairs in California would have very high impacts. The probability of a spill occurring and affecting peregrines is very low due to the low probability of a spill occurring and the few numbers of peregrines in the area.

Bald Eagle: Normal activities are not likely to impact this species. Like the peregrine, an accidental oil spill could cause the loss of important feeding habitats of this bird. The probability of a spill occurring, contaminating prey of the eagle, and then impacting the bird is very low. Impacts to bald eagles from the proposal are expected to be low.

Southern Sea Otter: The Central California Planning Area contains the largest numbers and most of the breeding population of southern sea otters. Normal activities from the proposal are expected to have very low impacts to this species. Accidental events, such as an oil spill, could have locally low to high impacts if sea otters were oiled. Over the life of the proposal, one spill greater than 1,000 barrels is expected to result from Central California lease sales. The probability of one or more spills occurring is 35%. The southern sea otter is very sensitive to oil. Sea otters are dependent on fur to maintain a warm body temperature. Studies have shown that when fur becomes fouled with oil, the animals experience hypothermia and death may occur. Loss of individual otters would have locally high, but regionally low significance.

Although oil spill containment measures and possibily dispersants would be employed to prevent oil from reaching sea otter habitat it is possible that a spill could hit a sea otter colony resulting in deaths to many animals. If breeding animals perished, locally high impacts could occur.

Depending on the number of otters imported, the condition of the oil, and other factors, mortality could attain regional significance. It is unlikely that impacts from a single spill would exceed moderate for the entire population.

Studies are presently being conducted by the MMS to improve clean-up and rehabilitation procedures to assist oiled otters. Strategy and location of equipment and facilities for the rescue and transport of animals are also being evaluated. Preliminary results from one MMS funded study of sea otters (conducted by the Hubbs Sea World Institute) indicate rehabilitation of oiled sea otters is not only feasible, but that a high rate of success can be achieved. As with oil spill containment and or cleanup measures, sucessful implementation of acted sea otters rehibilitation would serve to reduce risk to the population.

Gray Whale: Normal activities are likely to cause low impacts to gray whales due to noise associated with oil and gas seismic operations and the operation of one platform. Impacts are the same as those discussed for other planning areas which this species migrates through. In the event a spill occurred, gray whales could sustain regionally low to moderate immpacts if a large number of animals perished or were stressed by contact with oil. Gray whales are not reported to avoid oil slicks. The probability of one or more spills occurring is low, 35%. While it is possible a spill could occur while gray whales are migrating it is unlikely that this species would suffer impacts exceeding regionally low significance.

Other Whales: Impacts to other whales are expected to be low from normal activities due to the few individuals of each species which are likely to occur in the Central California Area at any one time. Low level and short-term impacts from seismic noises are considered likely. Noises generated from the one platform expected from this proposal will have very low impacts. Accidental oil spills are similarly unlikely to contact these species due to their in-frequent appearances in the area. Individual whales, if oiled, could perish or suffer low to moderate impacts from physiological stress. Locally moderate to high impacts could occur. Impacts resulting in loss of northern right whales could attain regional significance.

California least terns: Normal activities are not liable to affect this species unless nesting areas are disturbed by onshore construction. Least tern colonies are located in Alameda and San Mateo Counties. The largest colony is in this area adjacent to Oakland Airport. Accidental oil spills could cause the loss of individual birds. Locally significant, but probably regionally low to moderate impacts could occur.

CONCLUSION: Impacts to threatened and endangered species in the Central California Planning Area are expected to be low regionally to moderate locally. Normal activities are likely to have very low impacts to most species. Low impacts to cetaceans could occur due to noise. Impacts to the southern sea otter from accidental oils spills are unkikely to exceed moderate at the population level.

CUMULATIVE IMPACTS: The cumulative effect of OCS development activities and other ongoing activities on threatened and endangered species would probably have very low to moderate levels of impact similar to but greater than what is projected for the proposal. The cumulative scenario assumes that three platforms are required to develop the resources. Potential impacts from normal activities to threatened and endangered species would probably increase but remain low. Platform discharges are not expected to have effects on these species although prey species of some birds may be affected. Noise levels should not increase significantly to cause adverse effects. Overall, impacts are expected to remain very low to low from normal activities.

This increment of risk contributed by the proposal is considered moderate in terms of the cumulative risk for five oil spills from all sources in the Planning Area. The probablility of one or more spills occurring is 98%. Most threatened and endangered species would experience locally high impacts if contacted with oil. Breeding species such as the southern sea otter could suffer regionally significant impacts. Multiple spills in the same area during the life of the proposal could elevate significant impacts at least one level due to the inability of a population to recover before a second event. The chances of two spill contacting the same area twice are very low.

With or without the proposal, some species are expected to suffer low to moderate impacts during the life of the proposal. Migrating species are subjected to stresses from anthropogenic sources throughout the Pacific coast. The southern sea otter has suffered several mortalities in recent years due to nearshore gillnetting activities. Recent legislation by the State of California have halted much of the losses, but dead individuals are still being recovered. Brown pelicans suffered severe breeding losses as the result of DDT discharged from municipal and industrial outfalls in southern California. Loss of habitat and human disturbance have been and will probably continue to be the most serious impacts to avian fauna.

CONCLUSION: The cumulative impacts from the proposed OCS lease sales in Central California, combined with other OCS and non-OCS activities within the range of threatened and endangered species, are expected to have regionally low to locally moderate ecological impacts.

(g) Impacts on Estuaries and Wetlands

Estuaries and wetlands are critical areas of high productivity and contrain distinct assemblages of fish, birds, invertebrates, and plants. The estuarine intertidal and subtidal benthic community plays an important role in the overall ecology of an estuary. Any event which destroys a large proportion of this community in a bay will have a significant effect on other communities in the bay, such as fish, birds, and even terrestrial mammals which depend upon salt marshes for feeding. Wetlands are important habitats for many species during at least one stage in their life cycle; examples are the California black and clapper rails. Geographic isolation has prevented easy genetic missing for some species. Repopulation or restoration, once a wetland is destroyed, is slow or impossible.

Proposal related factors potentially affecting wetlands are oil spills and possible onshore construction. The activities associated with offshore drilling and platforms are not expected to cause impacts on estuaries and wetlands. Impacts on fish, marine mammals, and endangered species of estuaries are discussed in Sections IV.B.9.a.(4)(d),(e),(f),and (g).

One oil spill greater than 1,000 bbls is assumed to occur as a result of this proposal. Should an oil spill occur and contact an estuary, impacts lasting over 5 years could occur. The lack of substantial estuarine wetland habitat (except for Elkhorn Slough and Morro Bay) to the south of San Francisco Bay, is a cause for concern because there are so few areas to act as a source of brood stock or buffer against signifiant impacts to the adjacent ocean areas. The ocean areas are partly dependent upon estuaries for biological and nutrient resources.

Although most historical data on the impacts of oil spills on estuaries comes from outside central California, the habitats are similar enough to predict that the severe impacts caused by crude oil in estuaries in other areas (Bender, et al., 1977) would also occur in California. In the event of a large spill which completely covers the surface and the tidal flats of an estuary, and remains for several days, destruction could be manifested for over 10 years. Some species within the estuary, if endemic, may be permanently eliminated. Artificial restocking of the habitat may also be necessary. More detailed examinations of the impacts on estuaries and wetlands can be found in BLM (1975, 1979, and 1980).

Studies on the important estuarine salt marsh communities indicate it is necessary to have large quantitis of oil covering the area long enough for oil to penetrate into the sdiment before high mortalities to the entire salt marsh community occur. Baker (1971a) reported most marsh seed plants recovered from light single dose coverage by crude oil although leaves wre killed, eliminating primary productivity until the following season. The loss of cover or food supplied by the leaves could cause high impacts to species dependent upon them. Evidence has also been presented which indicates actual growth stimulation of salt marsh plants due to light oiling (Baker, 1971b). Causes for this phenomenon primarily involve greater release of nutrients from killed organisms or from oil itself.

Once in the sediments of an estuary, oil can remain for years. The residence time and resulting impact depends upon the wave of energy, type of substrate and vegetative cover present, and type of oil. When the substrate is heavily oiled, erosion can be increased 24 times. Population densities may continue to decrease for several years before recovery commences. Vendermeulen (1977) reported that some of the intermedicate compounds during oil breakdown were more toxic than the original. It required 2 years for _Spartina_ to begin recovery at Chedabucto Bay from a Bunker C spill (Vandermeulen, 1977). Refined oil is typically more toxic than crude, so the recovery rate reported by Vandemeulen may be longer than can be expected from a crude oil spill.

Some species in salt marshes and all seedlings of marsh flat seed plants are very susceptible to oil (Baker, 1970). Plants having shallow roots, with no food reserves are quickly killed and cannot recover except from new seeds. Pickleweed (_Salicornia_ ssp.) is such a very susceptible species.

However, the California species of Salicornia occurs at the upper reaches of high tide, and is not always covered even at high tide. Therefore, it would not be oiled except during very high tides. Pickleweed is an important component of the endangered black and clapper rails. Loss of the pickleweed habitat could have serious effets on the rails of an estuary.

Predicting the recovery period from prolonged oil coverage of an estuary is complicated by how long the oil in the substrate remains toxic, thereby preventing or slowing repopulation. Recovery from a severe spill, if most species have been eliminated, could involve a successional sequence where preclimax species occupy a habitat, temporarily outcompeting the climax species. This could cause recovery to take longer than ordinarily would be required.

According to Shenton (1973), recovery of a mud flat would require over 10 years. The important salt marsh would be effectively killed for 6 months to a year from a small coverage, but completely killed for an unknown time (until the sediment becoms nontoxic enough to sustain seed germination and sexual maturation) if the coverage is heavy and lasts several days.

Since the openings to estuaries and the protective ability of oil containment-diversion equipment is highly variable, it is necessary to generalize when discussing potential impacts of oil spills on estuarine habitats. With the use of conventional containment-diversion techniques, it is assumed that estuary openings of greater than 100 meters are extremely difficult to protect by completely sealing off once oil approaches the mouth, however diversion may still be possible.

Estuaries within central California having openings of 100 meters or greater are Bodega Bay, Tomales Bay, San Antonio, Drakes-Limantour Estero, Bolinas Lagoon, San Francisco Bay, Rescadero Marsh, Pajarro River/Watsonville Slough, Elkhorn Slough.

The probability of a large (1,000 bbl or greater) oil spill occurring is 35 percent. Should a large oil spill occur and enter an estuary the impact would be very high if the oil covers a significant portion of the estuary and remains for several tidal cycles or low for a spill covering a smaller portion of the estuary or one covering a significant portion of the estuary, but remaining for only a couple of tidal cycles.

CONCLUSION: Impacts of the proposal on estuaries and wetlands are expected to be low.

CUMULATIVE IMPACTS: Cumulative impacts to estuaries and wetlands could result from OCS oil and gas activities, tankering of imported oil, sewage disposal from onshore resources, consultation, and other causes. The total number of large 1,000 bbl or greater spills from all future, past and present oil activities is, including import tankering, assumed to be 5 (4.48) with a 98 percent probability of occurring. Such a spill enter an estuary, low to very high impacts would result as discussed above. If the two additional platforms assumed under the cumulative scenario are located directly off estuaries with "wide" (100 meter) openings (are unlikely occurrence) a spill that would flow directly inshore would be difficult to contain or divert before entering the estuary.

CONCLUSION: Cumulative impacts on estuaries and wetlands are expected to be moderate.

(h) Impacts to Areas of Special Concern

The definitions for the State-designated areas of special concern are discussed more fully in Section III.C.8. These areas include marine life refuges, ecological reserves, areas of special biological significance (ASBS) and underwater parks and are designed to protect intertidal and shallow water subtidal inhabitants. Additionally, the California Sea Otter Marine Life Refuge in central California was established to protect the sea otter populations.

Oil spills would cause impacts on the shallow subtidal and intertidal areas to the extent that is discussed in Section IV.B.9.(4) and 10.(4). The impacts from a large spill could be an insignificant interference with ecological relationships lasting less than a year for the shallow subtidal areas and a significant interfernce with ecological relationships lasting for less than 2 years for the intertidal. This conclusion is primarily based upon the large Santa Barbara oil spill (Straughn, 1970; Foster, 1974 and Foster, et al., 1971).

Although most of the areas of special concern involve intertidal or subtidal benthic communities, some of the areas are important seabird or marine mammal habitats (Farallon Islands, Ano Nuevo and Northern Channel Islands). See Sections IV.B.9.a.(4) for a discussion of impacts to these species. Impacts to sea otters, from a large oil spill could be expected to cause a moderate to major reduction in the size of the California population requiring several years to decades for recovery.

Impacts to the special designated areas could also come from pipelines. However, with the high degree of concern placed upon these areas by the State of California, it is highly unlikely that pipelines would be allowed to transverse them. Impacts associated with platform construction are not expected to occur since minimum distance of 3 miles away from these activities would be too far away to cause significant impacts.

There should be no significant impacts to areas of special concern in central California from the combined 11 exploratory and 30 development/production wells on a single platform from normal operations because of the distance separating the platforms and areas of concern. The probability of one or more large (1,000 bbl or greater) spill occurring is 35 percent. Should a large oil spill occur and contact an area of special concern, the impacts will vary from low for shallow subtidal and intertidal areas (see Section IV.B.9.a.(4)) to very high for a massive spill entering and remaining in an estuary for several tidal cycles. For estuaries (see Section IV.B.9.a.(4)). Impacts on marine mammals and birds will range from low through high (See section IV.B.9.(4)) for impact definitions specific to these biological resources.

CONCLUSION: The impacts of the proposed action on areas of special concern are expected to be moderate.

CUMULATIVE IMPACTS: The total number of large (1,000 bbl or greater) spills from all future, past and present oil activities is assumed to be 5 (4.48) with a 98 percent probability of one or more large spills occurring. The impacts ranging from low to very high, discussed above, will remain the same, but the probability will be increased.

CONCLUSION: Cumulative impacts on areas of special concern are expected to be high.

(i) Impacts on National Marine Sanctuaries

The Point Reyes Wilderness Area/National Seashore essentially comprise the Point Reyes Peninsula from the mouth of Tomales Bay to the Point Reyes Bird Observatory a few miles north of Balanas Point. This area, contains unaltered intertidal areas and the estuary Drakes-Limantour Estero, has similar boundaries to the marine sanctuary.

The Point Reyes/Farallon Islands Marine Sanctuary contains the largest breeding colony of seabirds in California and is an important pinniped rookery. The waters of the area are highly productive and are an important foraging area for the birds and pinnipeds.

Impacts on the nominated Morro Bay National Marine Sanctuary are given in Section IV.B.9.a.(4)(g).

Impacts on the Point Reyes Wilderness Area/Point Reyes/Farallon Islands Marine Sanctuary would be the same as those of Areas of Special Concern (Section IV.B.9.a.(4)(h)).

CONCLUSION: Impacts on marine sanctuaries are expected to be low. See Section IV.B.9.A.(b) regarding subarea deferrals. This area has been deferred from leasing in the new 5-year program.

CUMULATIVE IMPACTS: The estimated number of large (1,000 bbl or greater) spills from all future, past and present oil activities including tankering of imported oil is 5 (4.48) with a 98 percent probability of one or more large spills occurring.

The impacts ranging from low to very high discussed above will remain the same, but the probability of these impacts occurring will be increased.

CONCLUSION: Cumulative impacts on marine sanctuaries are expected to be moderate.

(5) Socioeconomic Environment

(a) Impact on Employment and Demographic Conditions

The agents which impact demographic and employment conditions are discussed in Section IV.B.7.a.(5)(a).

Increases in population, employment and income as a result of the Proposal are to peak in 1998 and 1999, and permanent changes in population, employment and income are expected to be level from 2000 to the conclusion of production in 2025. Employment is expected to peak at 1200 jobs and then decline to 72 jobs for the remainder of the project life. Five hundred seventy five of the peak jobs or 35 of the permanent jobs are expected to be in the oil and gas industry. Population is expected to rise by 1480 people in the years 1980-2000 and level off at 90 new residents for the remainder of the project Life. Personal income as a result of the proposal is expected to peak at approximately $19.1 million and to level off in 2000 at 1.1 million.

CONCLUSION: The peak impacts from the proposal are an increase of 0.09 percent in employment, of less than 0.07 percent in personal income and 0.06 percent in population. The overall impacts as a result of the proposal are considered to be very low, however, some localized impacts could be higher if all the impacts were concentrated in any one location.

CUMULATIVE IMPACTS: Cumulative impacts are expected to result in change in population, employment and income and are expected to peak 2000, and permanent change in population, employment and income are expected to level from 2001 to the conclusion of production in 2024.

Employment is expected to peak at 2200 jobs and then decline to 216 jobs for the remainder of the project life. One thousand eighty five of the peak jobs or 105 of the permanent jobs are expected to be in the oil and gas industry. Population is expected to rise by 2700 people in the year 1990 and level 260 new residents for the remainder of the project life. Personal income as a result of the proposal is expected to peak at approximately $35 million and to level off in 2000 at $3.4 million.

CONCLUSION: The peak impacts from the proposal are an increase of 0.13 percent in employment, 0.13 percent in personal income, and 0.2 percent in population. The overall cumulative impacts are considered to be very low, however, some localized impacts could be higher if all the impacts were concentrated in any one location.

(b) Impact on Coastal Land Uses and Water Services

(i) Land Use

Central California does not have any current Pacific Outer Continental Shelf oil and gas development. The region, however, does contain a major port, San Francisco, and the area around Monterey Bay is serviced by gas pipelines. Overall, this planning region lacks an integrated system of onshore facilities to process and transport OCS oil and gas. Under the proposed action, one hypothetical platform is anticipated to be located in the Central California planning area. It would be constructed in 1995. Under this alternative, all oil produced would be tankered to existing facilities in San Francisco Bay. Supply bases may be located in San Francisco, Monterey Bay and/or Bodega Bay.

During the exploratory phase a temporary support base (5-10 acres) would be needed. Nearly any harbor with industrially zoned land would be suitable.

Due to the temporary nature of the exploratory phase, land use impacts beyond the construction of a support base or bases are expected to be virtually non-existent. Port facilities within San Francisco Bay have available capacity. Harbor facilities around Monterey Bay and Bodega Bay are at capacity. The usage of these ports to support oil and gas activities will strain the resources of these ports and many result in the displacement of some existing uses. If development occurs in the Monterey Bay and Bodega Bay areas potential impacts could be very high.

The construction phase will only have a minimal land use impact. Construction activities are expected to be low as the oil produced will be tankered to existing facilities in San Francisco and no onshore facilities will be constructed to support gas development. To support the platform, a permanent supply base (25 to 50 acres) would have to be established. If the supply base is located in the San Francisco Bay area, there would be available land for such a facility. The establishment of a permanent supply base at Bodega Bay or Monterey Bay would result in land use conflicts. The harbors are currently operating at capacity, lack space for expansion, and existing uses may be displaced. Land use impacts can be very high around Bodega Bay and Monterey Bay if development occurs in the area.

The production and decommissioning phases are anticipated to result in virtually no new land use impacts. The decommissioning phase will have the effect of making the land available for other industrial uses.

CONCLUSION: Impacts on coastal land use are expected to be low.

CUMULATIVE IMPACTS: The establishment of additional platforms will tend to lengthen the period of time that the exploratory and construction phases will affect land use. Otherwise land use impacts will be identical with that of the proposed action.

CONCLUSION: Cumulative impacts a coastal land use are expected to be low.

(ii) Water Services

Water services are not expected to be affected in the San Francisco Bay area. This area already contains an extensive water service system which supports industrial activity. Water services around Bodega Bay and Monterey Bay will be affected if any Pacific OCS oil and gas development were to take place potential impacts would be expected to be high. Both Monterey Bay and Bodega Bay have a fresh water supply problem as demand is exceeding supply. To partially alleviate this problem, a building moratorium has been put into effect around Bodega Bay. The impact of OCS development on local water supplies can be partially alleviated by desalinization.

Waste water facilities are adequate to meet existing needs around Bodega Bay and Monterey Bay. Industrial development will impact waste water treatment facilities. The temporary and permanent supply bases would need water for sanitation and the disposal of industrial wastes. This may result in wastewater production exceeding treatment capacity and facility modification to permit the treatment of industrial wastes.

CONCLUSION: Water service impacts will be very low.

CUMULATIVE IMPACTS: Water service in the San Francisco Bay area will not be impacted by continued OCS Development in the Central California Planning Area. Should OCS development affect Bodega Bay or Monterey Bay, water services will be impacted by increased demand for a limited supply. This may result in water rationing, building moratoriums, and the displacement of some users to areas where these services are not as restricted.

CONCLUSION: Cumulative water service impacts are expected to be low.

(c) Impacts on Commercial Fisheries

Like fish resources, commercial fisheries of central California are very similar to those to the north. Therefore impacts to commercial fisheries in the areas mentioned in section IV.B.9.a(4)(c) are expected to be the same as those mentioned for nothern California (section IV.B.8.a(5)(c)), with the exceptions or modifications noted below.

Wetfish (anchovy, herring, sardine, mackerel) are bigger fisheries here because of larger populations or the presence of extensive or concentrated spawning areas. Impacts to the fish populations would be more severely felt by commercial fishermen, and OCS activity (vessel traffic, facilities) in these areas is more likely to interfere with fishing operations. Therefore the impact level could reach moderate but is expected to be very low because of the projected low level of plan-related OCS activities.

The Monterey Bay based squid fishery could suffer a high level of loss if an oil spill reached important habitat or fishing areas or ports. Based on the low oil spill potential, however, the anticipated impacts to this fishery are low or very low.

CONCLUSION: Commercial marine fisheries of central California are expected to sustain very low impacts as a result of actions ensuing from this 5-year plan. Individual fisheries may incur higher losses under certain circumstances.

CUMULATIVE IMPACTS: Central California commercial fisheries may be impacted to a moderate degree if the proposed lease sale in this plan leads to the discovery of resources suitable for further development. Increased vessel traffic and competition for harbor space will be the principal causative agents. Especially susceptible would be nearshore, inshore, and bay/estuarine fisheries such as those for herring, squid, and crabs. However, it is likely that onshore infrastructural facilities for OCS related activities will limit the scope of exploration and development, causing it to spread out over a greater time period, lessening the impacts to commercial fisheries.

CONCLUSION: Long term impacts to central California commercial fisheries will be low.

(i) Recreational Fisheries

As with commercial fisheries, impacts to larger species will affect sport fisheries. Increased OCS vessel traffic will not have as big an impact recreational fishermen as on commercial ones because of better vessel mobility and the lack of use of set gear. The projected platform might attract target species which could increase catches.

CONCLUSION: If the proposal causes any impact at all to sport fisheries it likely will be very low.

CUMULATIVE IMPACTS: Long term impacts are similar to short term impacts. Additional discoveries leading to additional platforms would increase reef-related impacts. Increased fishing at platforms could reduce populations over itme, leading to reduced catches. This could also lead to a cyclic patern in fish populations, and hence in fishing effort, leading to instability in the commercially related aspects of this resource.

CONCLUSION: Cumulative impacts are expected to be very low.

(d) Impacts on Recreation and Tourism

Offshore oil and gas operations have the potential to impact recreational resources in the Central California planning area as is described for Washington and Oregon in section IV.B.7.a(5)(d).

As a result of this Proposal, it is estimated that over the life of the field (25-35 years) in the Central California planning area one (0.59) oil spill greater than 1,000 barrels will occur. The probability of the spill occurring is low (35 percent).

Therefore, oil spills are expected to have a very low impact on recreation and tourism as a result of the Proposal. Additionally, no long term impact is expected to visual resources in the region from oil spills.

The level of impact to recreational resources caused by an offshore platform is mainly visual and depends upon the distance offshore the platform is located, and the recreational resources that are on the stretch of coast adjacent to the platform site. The farther offshore a platform is located, the less the level of impact that will occur to the onshore resources.

The proposal is also expected to result in the installation of one platform. It is not known where the platform will be installed, but it is assumed to be located off Pigeon Point.

The platform is expected to have a very low impact on recreation and tourism (no measurable change in visual quality occurs; few people notice changes. and there is no change in recreational use or property value) with a localized low impact to tourism. Visual resources will suffer a very low impact over the planning area and a low impact at the local level. However, at the local level, certain stretches of coast could experience a moderate impact or a high impact if the platform is located in the first tier of tracts.

CONCLUSION: The expected impacts to recreation, tourism, and visual resources as a result of the proposal are very low. Localized low impacts are expected to recreation, tourism, and visual resources as a result of offshore platforms in the immediate local area. See section IV.B.9.a.(6) for a discussion of subarea deferrals.

CUMULATIVE IMPACTS: Impacts to recreation and tourism, and their allied resources, are expected to occur from other projects which are described in IV.B.9.a. and which may occur in the region. However, since State and local jurisdictions have primary authority over onshore development, it is assumed that their requirements will hold the impact level to low.

It is estimated that five (4.48) oil spills will occur in the central California planning area as a result of cumulative sources.

There is a 98 percent probability that one or more oil spills greater than 1,000 barrels will occur in the planning area.

In addition it is estimated that three platforms will be installed. Here again it is assumed that the platforms will be installed off Pigeon Point, off Bodega Bay, and south of Ano Nuevo. This will have a very low impact on recreation and tourism over the planning area, with localized low impacts. The platforms are expected to have a low impact on the local visual resources, but if the platforms are farther offshore no impact is expected, and if the platforms are located close to the three mile line, a high impact could result to visual resources.

CONCLUSION: Cumulative impacts on rereation and tourism are expected to be very low regionally but possibly low locally.

(e) Archaeological Resources

Offshore oil and gas operations have the potential to impact archaeological resources in Central California as described for Washington and Oregon in section IV.B.7.a.(5)(e).

As a result of the proposal it is estimated that one platform will be installed in the central California planning area. Is is not known where the platform or associated bottom disturbing activities, including pipelines, will be installed and ocurr, but it is unlikely they would contact any archaelogical resources. Therefore no impacts from platform or pipeline construction activities are anticipated.

However, it is estimated that one (0.59) oil spill greater than 1,000 barrels will occur in the Central California planning area. The probability of an oil spill occurring is low (0.35). Since an oil spill could damage archaeological resources by direct oiling, by degrading the viewshed, and by causing inadvertent damage to the resources during clean-up operations, a very low impact is expected to archaeological resources as a result of the proposal.

CONCLUSION: Very low impacts to archaeological resources would be expected from the proposal.

CUMULATIVE IMPACTS: Impacts to archaeological resources over the region will occur both offshore and onshore as a result of the other projects which are described in IV.B.9.a. This is expected to result in a low impact over the planning area.

As a result of future OCS proposals it is estimated that three platforms will be installed. These platforms and the associated bottom disturbing activities are not likely to contact any archaeological resource as surveys may be required prior to any bottom disturbing activity to ascertain that no archaeological resources are disturbed. There is a 98 percent probability that one or more oil spills greater than 1,000 barrels will occur as a result of future proposals. As oil spills have a potential to damage archaeological resources by direct oiling, by degrading the viewshed, and by causing inadvertent damage to the resources during clean-up operations, this is expected to have a very low impact on archaeological resources.

CONCLUSION: Cumulative impacts are archaeological resources are expected to be low.

(f) Impacts on Marine Vessel Traffic

See section IV.B.7.a.(5)(f) for a discussion of generic impacts.

A very small increase in marine vessel traffic (i.e. tankers, crew and supply boats, seismic exploration vessels) is expected to occur offshore central California as a result of this proposal. This very small increase in vessel traffic would be due to supporting the level of activity anticipated in this planning area-one platform, 11 exploration wells, and 30 development wells.

Any increase in vessel traffic potentially increases the risk of accidents (between vessels or between platform and vessel). These accidents could result in the loss of human life, personal injuries, property damage, and oil spills. Additional conflicts could also arise from increased port congestion and competition for port facilities such as docking berths. These potential problems are expected to be minimal, however, due to the very low level of activity anticipated in this planning area (one platform and support activities) and the continued enforcement of Coast Guard navigational safety requirements and policy. Coast Guard policy has been to not allow fixed structures in vessel traffic lanes, or precautionary area, or safety fairways, and to not allow a "gated" situation whereby two or more nearby platforms are on opposite sides of a vessel lane.

Oil spills, regardless of source (vessel collisions, platform blowouts, pipeline failures, etc.) may impact vessel traffic. Traffic may have to be rerouted to avoid the area of contamination in order to avoid both direct contact with any spilled oil and to not interfere with cleanup operations. The risk of oil spill occurrence in central California from the proposal is considered moderate (35% probability of one or more spills occurring from OCS activities). These impacts to traffic would be only short-term (generally 1-month or less) and limited to the offshore area contaminated with oil (generally very small discontinuous oil patches, depending on the spill size and weather). See section under "cumulative" below for further discussion on oil spills.

Installation of offshore platforms would also represent a benefit to navigation through lighting, fog horns, radar, and other navigational aids.

CONCLUSION: Very low impacts are expected from the proposal to marine vessel traffic. This is due to the very low level of activity predicted (one platform and accompanying support traffic) representing a very small overall increase in vessel traffic (no rerouting of proposed vessel lanes necessary) and a very small increase in risk of vessel accidents.

CUMULATIVE IMPACTS: There is currently no oil and gas activity in the OCS in central California. In the unlikely event that all the tracts on the Federal OCS are leased and developed, it is estimated that three platforms, 33 exploration wells, and 84 development wells would result. The impacts associated with this level of activity are considered very low as the increase in overall marine traffic would be minimal, thereby increasing the risk of vessel conflicts and accidents an insignificant amount.

Under the cumulative scenario it is assumed that five spills of 1,000 bbls or greater over the 25-35-year life of the field would occur in this planning area. Impacts to vessel traffic from oil spills would be of short-term duration (generally one month or less), and may require temporary rerouting of traffic or slight delays in using port facilities. San Francisco Bay area is a major world port. It includes the ports of San Francisco, Oakland, Richmond, and Redwood City, among others. If a large oil spill occurs in the vicinity of the entrance to San Francisco Bay it may cause major impacts to marine vessel traffic. These impacts would be in the form of temporary port entrance closure, oil contamination of ships, or rerouting of vessel lanes temporarily. The recent Puerto Rico tanker spill (November, 1984) was considered a fairly large spill (35,000 bbls), and took place in the vicinity of the entrance to San Francisco Bay. It did not, however, cause any significant impacts to marine vessel traffic.

CONCLUSION: Very low impacts are expected from the cumulative level of development to vessel traffic. This is due to the very low level of activity predicted (three platforms and accompanying support traffic) and the resulting small risk of vessel accidents or conflicts.

(g) Impacts on Military Uses

Offshore oil and gas operations have the potential to impact military operations in central California as described for Washington and Oregon in section IV.B.7.a(5)(g).

As a result of this proposal it is estimated that one platform will be installed in the Central California planning area, and this is assumed to be off Pigeon Point.

As most of the military operations in the planning area is conducted by the Navy and the Air Force, at least 6 to 15 miles offshore, and involves mainly flight training, missile firing and testing, submarine diving and transitting, and anti-submarine warfare training, a very low impact is anticipated from the installation of the platform.

If the platform is located in an area used for military operations the impact level will rise significantly to possibly a high impact. However, consultation regarding joint use of the OCS is required by memorandum of agreement between DOI and DOD in order to resolve use conflicts prior to OCS lease sales (see Appendix J).

It is estimated that one (0.59) oil spill greater than 1000 barrels will occur in the planning area as a result of the proposal.

The probability of the spill occuring is slight (0.35). As oil spills have a potential to impact military uses mainly because of the increased vessel traffic associated with clean-up operations, a very low impact for oil spills is expected for military uses as a result of the proposal.

CONCLUSION: Overall impacts to military operations in the planning area are very low as a result of the proposal.

CUMULATIVE IMPACTS: The cumulative impacts to military uses are not expected to be significant due to the limited area of military use off Central California.

As a result of future OCS proposals it is estimated that three platforms will be installed, and 4.48 oil spills are estimated to occur in the planning area. It is not known where the platforms will be installed but it is assumed that one will be off Pigeon Point, one off Bodega Bay, and one South of Ano Nuevo. As most of the military activities do not occur in the immediate area of the assumed platform sites, a low impact is anticipated from the installation of the platforms.

There is a 98% probability of one or more spills greater than 1,000 bbls occurring. As the possibility that a spill will cause disruption of military operations is slight, a low impact is expected in the planning area.

CONCLUSION: Cumulative impacts on military uses are expected to be very low regionally to low locally.

(h) Impacts on Native Subsistence

Offshore oil and gas operations have the potential to impact Native Subsistence in Central California as is described for Washington and Oregon (see section IV.B.7.a(5)(h)).

As a result of the proposal, it is estimated that one (0.59) oil spill greater than 1,000 barrels will occur in the Central California planning area. The probability of the spill occurring is low (0.35). As oil spills have a potential to damage native subsistence resources primarily shellfish and salmon primarily by direct oiling, and by causing destruction of the intertidal resources during clean-up operations, a very low impact is expected to native subsistence over the planning area, with potential localized moderate impacts at any location the spill contacts.

CONCLUSION: The expected impacts to native subsistence as a result of the proposal are very low, with potential localized moderate impacts.

CUMULATIVE IMPACTS. Impacts to Native subsistence will occur from onshore projects, which are described in IV.B.9.a, and these are anticipated to have a moderate impact.

It is estimated that five (4.48) oil spills will occur in the central California planning area as a result of cumulative sources. There is a 98 percent probability that one or more oil spills equal to or greater than 1,000 barrels will occur in the planning area.

As oil spills have a potential to damage native subsistence resources primarily by direct oiling, and by causing destruction of the intertidal resources during clean-up operations, a low impact is expected to native subsistence over the planning area, with potential localized moderate impacts at any location the spill contacts.

CONCLUSION: Cumulative impacts to Native subsistence uses will be moderate.

(6) Subarea Deferrals

Six subareas within the Central California planning area are proposed to be deferred from leasing during the 5-year program.

(a). Point Reyes and Farallon Islands National Marine Sanctuary

The boundaries of the marine sanctuary are officially defined as follows:

"The sanctuary consists of an area of the waters adjacent to the coast of California north and south of the Point Reyes Headlands, between Bodega Head and Rocky Point and the Farallon Islands (including Noonday Rock), and includes approximately 948 square nautical miles.

"The shoreward boundary follows the mean high tide line and the seaward limit of Point Reyes National Seashore. Between Bodega Head and Point Reyes Headlands, the sanctuary extends seaward 3 nm beyond State waters. The sanctuary also includes the waters within 12 nm of the Farallon Islands, and between the Islands and the mainland from Point Reyes Headlands to Rocky Point. The sanctuary includes Bodega Bay, but not Bodega Harbor."

The shorelines consist of rocky shores and sandy beaches which maintain rich intertidal communities. The sanctuary contains the largest breeding colony of seabirds in California and is an important pinniped rookery. The waters of the area are highly productive and are an important foraging area for the birds and pinnipeds. See Sections IV.B.9.a.(4)(e) & (f) for further discussion on birds and pinnipeds.

Oil and gas exploration and development activities are prohibited by regulation in the Point Reyes/Farallon Islands National Marine Sanctuary.

The Point Reyes/ Farallon Islands Marine Sanctuary contains the largest breeding colony of seabirds in California and is an important pinniped rookery. The waters of the area are highly productive and are an important foraging area for the birds and pinnipeds.

Deferral of this Subarea from potential oil and gas development would reduce a variety of negative environmental impacts. First, the potential of an oil spill affecting the islands would be reduced thereby preserving the habitat for seabirds, pinnipeds, and other marine dependent life. Even if an oil spill from another area drifted into the area there would be less of it; it would be more weathered; and it would be less toxic. Second, the lack of exploration and development activity would mean that breeding, nesting, foraging, and migrating activities would not be disrupted.

(b). Point Reyes Wilderness Area

The Point Reyes Wilderness Area, extending from the mouth of Tomales Bay to the Point Reyes Bird Observatory, consists of 24,200 acres of wilderness and 8,530 acres of potential wilderness addition. Extending along nearly the entire coastline of the wilderness area and throughout Drake's Estero, the potential wildernesses were not designated wilderness areas because the State of California maintains certain fishing regulation authority. Lacking complete authority for the regulation of these areas, the National Park Service was unable to incorporate these coastal areas into complete wilderness areas. Outside of some already existing powerlines on Limantour Spit, development is prohibited in both the wilderness and potential wilderness areas.

The Point Reyes National Seashore includes the Point Reyes peninsula (64,546 acres) and was designated in 1962 "to save and preserve, for the purposes of public recreation, benefit, and inspiration, a portion of the diminishing seashore that remains undeveloped."

The upland area of the seashore is wild and undeveloped and maintains populations of deer, foxes, badger, mountain lion, and a variety of rodents and bird life. The seashore contains unaltered rocky shores and sandy beaches which maintain rich intertidal communities, serve as breeding and haulout areas for marine mammals, and as a nesting area for seabirds.

Deferral of this subarea would effect the following resources: Water quality in the area would suffer less impact due to the elimination of potential platforms, associated muds and cuttings, and potential oil spills within the deletion area. Impacts to intertidal communities on the Point Reyes Wilderness Area would be reduced due to the elimination of potential platforms and associated development activities. Similarly, the risk of potential platform spills originating from within this area would be eliminated. This would provide additional protection for the intertidal communities, marine mammal haulout areas, and seabird nesting areas.

(c). San Francisco Bay Subarea

This area represents a portion of the San Francisco Bay Vessel Traffic Precautionary Area and an adjacent area totalling 10 whole and partial blocks. The area is just south of the entrance to San Francisco Bay offshore of the San Francisco/San Mateo County line, and bounded to the north and west by the Pt. Reyes and Farallon Islands National Marine Sanctuary, and to the east by the 3-mile State jurisdiction line.

The San Francisco Bay Precautionary Area is part of the marine vessel routing system controlled by the U.S. Coast Guard and the International Maritime Organization. This area is directly adjacent to the entrance to San Francisco Bay, one of the busiest ports in the nation, and includes access to the Ports of San Francisco, Oakland, Richmond, and Sacramento. For calendar year 1982 the San Francisco Harbor had a total of 9,640 inbound vessel trips (U.S. Army Corps of Engineers, 1984).

The resources along the nearby coast include San Francisco Zoo, Lake Merced/Harding Park, Fort Funston, Burton Beach, Thornton State Beach, and Palisades Park. This region is of high aesthetic and recreational value due to the many beaches and coastal parks. The area also affords many panoramic ocean views from the beaches and from the steep bluffs above. Deferral of this subarea would reduce or eliminate potential impacts to vessel traffic, recreation and tourism, and aesthetics. This is due to several factors including eliminating the possibility of 1) platform placement and 2) oil spills originating from OCS oil and gas activities, in this area. Placing platforms in this area would increase the risk of accidents between vessels or between a vessel and a platform. Such accidents could result in the loss of property, lives, and major oil spills. Placing platforms in this area also represents a major loss of aesthetic value as this area is currently free of any offshore platforms and this area is important for recreation and aesthetics. In addition, any oil spills from OCS related activities would have to originate further offshore, allowing more time for cleanup activities and weathering (decreased effects and oil volume) of the spilled oil.

(d). Cordell Bank

Cordell Bank is a large seamount lying 50 miles northwest of San Francisco and approximately 30 miles north of the Farallon Islands. The center of the bank is near 38o01' north latitude, 123o 25' west longitude.

Cordell Bank is roughly elliptical and is 9.5 by 4.5 miles at the 91 meter depth contour. Overall the area is relatively flat at depths of 180 to 210 ft. (55 to 63 meters) but interrupted by steep pinnicles. There are at least 4 ridges within diving depths of 120 to 140 ft. (37 to 43 meters) although the shallowest depth is 114 ft. (35 meters). The biological community on Cordell Banks is described as "exceptionally lush and healthy, consisting of algae, invertebrates, fish, birds and mammals" (Schnieder, 1982). Schnieder states: The list of species which have been collected at Cordell Bank include many of the common organisms such as the strawberry anemone *Corynactis californica* and some uncommon or rare species such as the hydrocoral Allopora californica, and the diatom Entopyla cf. E. incurvata and the gastropod Pedicularia californica, and several new taxa, including at least two new genera of algae and a possible new species of the scallop Chlamys. It is very likely that many undescribed organisms exist at Cordell Bank and will be found in future studies.

The variation with depth of the communities is shown in the photographs from the 1979-81 expeditions. At 35 fathoms (210 ft) the rocks are quite bare; the biota are mostly solitary anemones and red algae. At about 30 (180 ft) fathoms, some large organisms such as sponges, urchins, and an occassional large anemone are present, but are widely spaced. Near 25 fathoms the cover is very dense, as described above. Between 25 and 20 fathoms, the cover is roughly homogeneous, with sponges, anemones, hydroids, and hydrocoral predominating. On the 19 fathom ridge at the northern end, the topmost portion is covered almost exclusively with a dense cap of barnacles and red algae. At this site the familiar sponge/anemone community appears below 21 fathoms.

Deferral of this subarea will reduce impacts to water quality in the area since no platform will occur. The water quality of the area is unaltered and pristine with respect to anthropogenic influences. The principal impacts that would be avoided by this deletion would be to eliminate the possibility of high impacts to the productive hard bottom benthic community and the hydrocoral Allopora californica.

(e). Monterey Bay

The Monterey Bay subarea would consist of a 3 to 48 mile buffer zone off Monterey Bay. The northern boundary would be a southwest line that extends from a point 6 miles north of Santa Cruz to a point 48 miles offshore along the northern Big Sur boundary which is due west of Malpaso Creek.

The important biological areas contained in this deletion area include the subtidal Monterey Canyon in Monterey Bay with its included hydrocoral Allopora californica. Intertidally, the rocky areas that are thought to be more unique and possibly more sensitive than most of the rest of the coast include Pacific Grove Marine Gardens ASBS, Cypress Point and Point Pinos, the area from Carmel River to Point Lobos. The important estuary in the deletion area is Elkhorn Slough.

The greatest public concern in this area has been expressed for the sea otter, whose range occurs within this deletion area.

Deferral of this subarea would provide protection for a significant number of resources in the Monterey Bay area by ensuring additional time for weathering, diversion and cleanup of an exploration or development related oil spill in the event such a spill should occur. Specific resources provided protection are mentioned above and include: 1) Intertidal Benthos- rocky intertidal areas of Pacific Grove, Cyprus Point, Point Pinos, Carmel River to the Point Lobos area; 2) Subtidal Benthos, including the Monterey Canyon; 3) the important estuary, Elkhorn Slough; and 4) the California sea otter habitat.

In addition, without oil production platforms in the area, water quality impacts would not occur.

(f). Big Sur Area

The Big Sur subarea is a buffer area whose northern boundary extends from Malpaso Creek near Yankee Point (just south of Point Lobos) due west 48 miles. The western boundary extends from the western end of the northern boundary southwest to the western end of the southern boundary. The southern boundary extends from the onshore San Luis Obispo County line to a point 131 miles due west.

This subarea includes the California sea otter population and range from the Monterey/San Luis Obispo county line north to Malpaso creek. In addition to the sea otter, thousands of seabirds, including the brown pelican, and gray whales use this section of the coast seasonaly. Over one million visitors a year (Sale 53 FEIS) visit this subarea and adjacent coastline, attracted to the many scenic areas and cultural attractions such as Hearst's Castle and various State parks and reserves.

Deferral of this subarea would eliminate oil and gas exploration, development, and production activities from occurring in the Federal OCS area from 10 miles off the California coastline from Monterey/San Luis Obispo county line north to Malpaso creek. The subsequent potential impacts from the elimination of these hypothetical activities would also be eliminated. Impacts such as reduction in air and water quality resulting from normal OCS operations; oil spills and the associated impacts on the biological and cultural environments; and impacts on the social and biological environments from normal OCS exploration, development and production activities such as disturbance from crew boats, demand for berthing areas and onshore facilities would be eliminated. However, this deletion would not affect the possible impacts from potential oil development in State waters, Federal development seaward of the buffer, or existing non-OCS tankering and shipping activities occurring within this proposed buffer area.

The deletion of this subarea could provide additional protection by providing a greater buffer area (assuming no oil development occurs within the State's 3 mile coastal area) between OCS Federal platforms and their potential oil spills from a number of environmental and cultural resources. A buffer area could allow more time for additional weathering of oil and for dispersion, diversion and/or cleanup of oil from oil spills occuring seaward of the buffer boundary.

b. Unavoidable Adverse Impacts

Oil spills, discharges of drilling muds and cuttings, formation water discharge, and sewage disposal will all cause minor unavoidable adverse impacts on water quality under the proposal. OCS development will increase the demand for onshore water services.

Unavoidable adverse impacts to ports and navigation could occur in the expected cases of oil spills. Minor traffic adjustments into and out of ports and rerouting through areas could be required.

OCS development will increase the demand for land. Land currently used for industrial uses or zoned for such uses will not experience an unavoidable adverse impact. Unavoidable adverse impacts will occur when OCS uses convert and to that use or when it displaces non OCS activity. OCS development will preclude the use of these affected land from other uses during the duration of OCS activity although this is expected to be on a highly local basis and not extensive locally or regionally.

There will be some unavoidable losses of submerged and terrestrial cultural resources. Losses are felt to be unavoidable due to the difficulty of detecting submerged and buried terrestrial resource sites.

Coastal benthic ecosystems would be unavoidably adversely affected from the proposal due to oil spills and various discharges. The level of impact is restricted geographically and temporarily.

The proposal could have unavoidable adverse impacts to fish resources as a result of oil spills, seismic operations, platform siting, and drilling discharges. Oil spill impacts whould occur mainly to surface fish, those with planktonic larvae, and intertidal residents. Seismic operations impacts, if they occur, would primarily affect species with planktonic larvae. Platform siting impacts would be incurred by benthic species, especially flatfishes, and benthic invertebrates. Impacts from drilling discharges also would be concentrated on less motile benthic species.

Commercial and recreational fishing could suffer unavoidable adverse impacts directly from oil spills, seismic operations, increased vessel traffic platform siting and indirectly from any action that negatively impacts target species (see above). Oil spills could foul boats and gear, making them unusable, or could preclude fishing areas. Towed seismic airrays could also foul gear. Increased OCS-related vessel traffic could hinder fishing operations, result in an at-sea collision which could disable fishing vessels, or compete for berthing space in ports and harbor Platform location could interfere with travel routes.

Unavoidable adverse impacts could occur to marine mammals and coastal and marine birds due to accidental oil spills. Threatened and endangered species could be more significantly affected due to their already stressed population levels. Noise from OCS activities are likely to cause minor adverse impacts to cetaceans.

Air quality in the immediate vicinity of an OCS oil and/or gas activity will be unavoidably affected. Emissions from internal combustion engines, turbines, leaky valves, etc., will degrade air quality near drill ships, platforms, pipelaying barges, refineries, and gas processing facilities.

Unavoidable adverse impacts to recreation could occur through beach closure if a spill hit shore during a tourist season. Oil spills could temporarily close marinas and boat launching facilities adversely affecting sportfishing, and boating.

Visual resources will suffer unavoidable adverse impacts due to platform construction on the OCS. Scenic areas will be visually degraded but the extent of degradation is dependent upon the placement of platforms. Visual adverse impacts will last the lifetime of the projected OCS oil and gas activities.

c. Relationship Between Short-Term Uses of Man's Environment and Long-Term Productivity

The proposal is expected to have a 30-year lifetime at minimum. Activities which precede the proposal, have a lifetime exceeding the termination of oil and gas activities, and which affect long-term productivity locally and regionally are water supply, recreation, land use, coastal ecosystems, commercial fisheries, and endangered and threatened species.

OCS development will increase the demand for water services. In areas where demand exceeds supply, OCS development could result in short-term scarcities, long-term productivity may be limited if the capacity of the water service can not be expanded to meet demand.

Recreation will suffer minor, localized short-term impacts due to the removal of coastal locations from recreational use for the duration of the project. Marine vessels associated with OCS activities may conflict with recreational and commercial fishing boats for berthing space, use of port and harbor facilities, and operating areas.

Coastal ecosystems are likely to suffer short-term impacts to productivity during various phases of OCS activity. These impacts could translate into long-term impacts on fisheries production and productivity of sensitive marine habitats. With the cessation of oil and gas activities, the marine environment is generally expected to return to previous levels.

The long-term effects of platforms and other OCS-related structures on commercial fisheries is not known, however no long-term adverse impacts on sports fisheries are expected. Platforms left in place after production stops could continue to function as either an artificial reef or an impediment to commercial fishing, especially traveling.
OCS development will increase the demand for land. Short-term impacts to the humand environment would include construction activity to develop land to support OCS development, the possible displacement of non OCS related development, and induced land use impacts resulting from OCS related population increases, long-term productivity of the land will not be affected. Open space, residential, industrial, or commercial land uses, are all productive land uses.

Coastal ecosystems are likely to suffer short-term impacts to productivity during various phases of OCS activity. These impacts could translate into long-term impacts on fisheries production and long-term impacts to productivity of sensitive marine habitats such as estuaries and shallow offshore reef areas. With the cessation of oil and gas activities, the marine environment is generally expected to return to its normal long-term productivity levels.

d. Irreversible and Irretrievable Commitment of Resources

The proposal to lease in Central California does not by itself result in the irreversible and irretrievable commitment of any resources. However, if oil and gas resources are explored, found and developed, the proposal is expected to result in the eventual irreversible and irretrievable commitment of 58 million barrels of oil and 1043 billion cubic feet of gas since, once these resources are produced and used, they will not be available for use at a futhre time.

Cultural resources in the Central California OCS is another resource that may suffer irreversible commitments of the resource if the proposal is adopted. Destruction or disturbance of a cultural resource site either by construction or by scientific exploration is permanent. The value of a site is lost to a very large extent if disturbed even if relics are subsequently recovered.

Migrating cetaceans, especially gray whales, may suffer irreversible impacts if the acceleration of OCS activities within its range causes or contributes to a shift away from current migration routes to less favorable migratory passages.

e. Impacts of a High Case Scenario

This section provides a discussion of the potential environmental impacts that could occur in the unlikely event that all unleased, undiscovered, economically recoverable hydrocarbon resources in the Central California planning area are leased and developed as a result of the proposal.

It is important to point out that Central California does not have existing offshore development. Resource estimates and infrastructure for the "High Case" are the same as the cumulative case. However, the High Case assumes that the resources will be developed as a result of the proposed 5 year program lease sales, while the cumulative assumes that leasing and development will extend over future five year programs lease sales.

The estimated "High Case" and cumulative case hydrocarbon resources for the Central California planning area are as follows: 560 million barrels of oil and 790 billion cubic feet of gas. Infrastructure expected to be used to explore and develop these resources includes 33 exploration and delineation wells, 84 development wells, and 3 platforms, which is identical to the infrastructure expected for the cumulative case. Only the number of oil spills greater than 1,000 barrels differs between the high case and the cumulative case-- two spills (1.73) assumed in the high case and five spills (4.47) assumed in the cumulative case. Thus, the expected high case impacts are virtually identical to the expected impacts for the cumulative case except for those resources where the difference between two and five oil spills would effect impact levels. There are only four such categories: fisheries resources; coastal and marine birds; estuaries and wetlands; and areas of special concern. For each of these categories the expected high case impacts are significantly affected by the assumed number of oil spills.

The high case analysis is based on the assumption of two oil spills greater than 1,000 barrels, while the base case assumes one oil spill (0.74). The difference of only one spill over the 30 year period of the analysis is not sufficient to casue changes in impact levels for those resources significantly affected by oil spills. Thus, for the four oil spill sensitive resource categories (fish resources, coastal and marine birds, estuanes and wetlands and areas of special concern) the expected high case impacts are the same as the expected impacts of the base case.

f. Alternative II - Subarea Deferrals

Selection of Alternative II would result in the deferral of all blocks in the Central California planning area seaward of the area of hydrocarbon potential. The deferral of this subarea would have no noticeable effect on the potential impact resulting from oil and gas development off Central California. Impacts are the same as described in Alternative I. It is likely that defferal of this subarea would have no effect on the likelihood of occurrence of an oil spill. (See figure II.A.2.a-10)

The deletion of the area would reduce potential localized water quality and visual impacts by precluding the placement of platforms within the subarea.

g. Impacts of Alternative III - Add a Sale in the Straits of Florida

Adding a sale in the Straits of Florida will not effect the Central California planning area. However, under Alternative III all sales proposed under Alternative I - the proposal would be held. Therefore, the expected impacts of Alternative II are identical to Alternative I for this planning area.

h. Impacts of Alternative IV - Biennial Leasing

This alternative would provide for biennial leasing in this planning area. Under the proposal (Alternative I), one sale would be scheduled for the Central California planning area (one in 1989). The number of sales would increase to two (one in 1988 and another in 1990) for this alternative. Also, the timing would change, moving the first sale up one year from 1989 to 1988.

Estimated hydrocarbon resources for Alternative IV in the Central California planning area are as follows: 297 million barrels of oil and 419 billion cubic feet of gas. Infrastructure expected to be used to explore and develop these resources includes 20 exploration and delineation wells, 43 development wells, and 2 platforms. Predicted oil and gas resources, and infrastructure are approximately 40% to 50% higher than those predicted for Alternative I (see Table IV.B.10.d.-1).

The expected number of oil spills remains essentially the same (.74 vs. .97) as the proposal, (one spill is assumed to occur for either alternative). Since the resource estimates and resulting infrastructure do not differ substantially, the impact levels of this alternative on all resource categories are expected to be the same as for Alternative I except that some localized effects (impacts on water quality and benthos) could be slightly more extensive due to the one more platform assumed for this alternative.

i. Impacts of Alternative V - Acceleration Provision

This alternative assumes the implementation of the acceleration of leasing from triennial to biennial sales under certain defined criteria (see Chapter II.A.5. for a detailed discussion of this Alternative). However, no lease sales would be added to the schedule. The one lease sale for the central California planning area will remain. However, the lease sale identified for 1989 would be moved up to 1988.

Estimated hydrocarbon resources for Alternative V in the Central California planning area remain the same as for Alternative I: 207 million barrels of oil and 292 billion cubic feet of gas. Infrastructure expected to be used to explore and develop these resources remains the same as well: 11 exploration and delineation wells, 30 development wells, and 1 platform.

The number of oil spills remains the same as the proposal, and the probability of one or more spills over 1,000 barrels is not expected to change for the planning area. Therefore, impacts for Alternative V are expected to remain the same as Alternative I, except that potential impact causing factors could be present in the planning area up to 1-year earlier than under Alternative I.

j. Impacts of Alternative VI - Defer Leasing in Six Whole Planning Areas: North Atlantic, Washington and Oregon, Northern California, Central California, Southern California, and North Aleutian Basin

Selection of Alternative VI would defer leasing in this 5-year program in all planning areas of the Pacific Outer Continental Shelf. The impacts resulting from this alternative would be the same as described for Alternative VII (No action) for the Central California planning area.

k. Impacts of Alternative VII - No Action

Under this alternative, the Secretary of the Interior would propose not to schedule any oil and gas lease sales for this proposed 5-year program. All potential impacts to the physical, biological, and socioeconomic environment resulting from hydrocarbon exploration, development, and production due to OCS leasing would be eliminated.

Oil and gas are currently the nation's primary energy source. Even with a vigorous conservation program the United States demand for energy will continue to grow. With the adoption of Alternative VII the oil and gas that would have been available as a result of this proposed program would no longer contribute to the national domestic production during the life of the program.

With the removal of the potential oil and gas into the national energy reserves, it would necessitate the increased production of energy from other conventional and non-conventional energy sources (See Appendix C), and/or increases in import levels from foreign sources. Impacts resulting from the development of the alternative energy sources are summarized in Section II.A.7. and discussed further in Appendix C.

Alternative VII would eliminate the contribution, from the Central California planning area, of 207 million barrels of oil and 292 BCF of gas to the domestic energy production. The energy potential of this quantity of oil and gas would have to be replaced by alternative energy sources.

Impacts resulting from the exploration, development, and production of these resources would be eliminated.

However, changes to the environment resulting from other projects which are planned for or are currently existing in the planning area could be expected to occur. Several of these are listed in Section IV.B.9.a.(1).

10. Southern California

a. Alternative 1

The proposal is to hold two sales in the Southern California planning area. It is estimated that the sales will produce about 462 million barrels of oil (mbbl) and 726 billion cubic feet of gas (BCF) over a 35-year period. Approximately 207 exploration wells will be drilled. These resources will be produced from 475 production wells from 10 platforms. In addition to the oil and gas, about 346 mbbl of formation water will be produced. Approximately 3 mbbl of muds and cuttings could be discharged into the sea over the life of the proposal.

(1) Interrelationship of Proposal with Other Projects and Proposals

(a) National Parks and Sanctuaries

For a full discussion of the marine sanctuaries program see Section IV.B.9.a.(1)(b). The following Federal sanctuaries are included in this planning area.

(i) Channel Islands National Marine Sanctuary

The Channel Islands National Marine Sanctuary is the only national marine sanctuary in the Southern California Planning Area. The boundaries of the marine sanctuary are defined as follows:

> "The Sanctuary consists of an area of the waters off the coast of California of approximately 1,252.5 square nautical miles adjacent to the following islands and offshore rocks: San Miguel Island, Santa Cruz Island, Santa Rosa Island, Anacapa Island, Santa Barbara Island, Richardson Rock and Castle Rock extending seaward to a distance of six nautical miles."

The purpose of designating the Sanctuary is to protect and preserve the extra-ordinary ecosystem including marine birds and mammals and other natural resources of the waters surrounding the northern Channel Islands and Santa Barbara Islands and to ensure the continued availability of the area as a research and recreational resource. The area supports a particularly rich and diverse marine biota, partially because of its location in a transition zone between northern and southern waters and partially because it is one of the very few areas off the Southern California coast that has been relatively unaltered by human use.

Except as may be necessary for national defense the following activities are prohibited: (1) discharge of substances; (2) alteration and construction of the seabed; (3) commercial vessels operation; (4) disturbing marine mammals and birds; and, (5) removing or damaging historical or cultural resources.

A more detailed listing of prohibited activities and exceptions under these categories is contained in 15 CFR 935.7.

Hydrocarbon operations pursuant to any lease executed prior to the effective date of the regulations governing the Channel Islands National Marine Sanctuary (15 CFR 935) is subject to those regulations contained in Paragraph (b) of 15 CFR 935.6. Hydrocarbon operations pursuant to leases executed on or after the effective date of these regulations are prohibited. See section IV.B.10.a.(b) for a discussion of subareas deferred from this 5-year program.

(ii) Santa Barbara Channel Ecological Preserve and Buffer Zone

The Santa Barbara Channel Ecological Preserve was established March 21, 1969 by Public Land Order 4587. The Preserve consists of ten full and partial tracts. Eight additional tracts (full and partial) adjacent to the Preserve were designated as "adjunct to the Ecological Preserve." These tracts have become known as the buffer zone. All tracts were subject to valid existing rights, and were withdrawn from all forms of disposition, including mineral leasing, and reserved for use for scientific, recreational, and other similar uses. See section IV.B.10.a.(b) for a discussion of subareas deferred from this 5-year program.

(b) Oil and Gas Sanctuaries

The California Oil and Gas Sanctuaries are specifically excluded from oil and gas leasing by the state. For a discussion on the program see Section IV.B.8.a.(1)(a). These areas are prohibited from development in state waters for environmental reasons.

The State of California has designated the following as oil and gas sanctuaries located adjacent to the Southern California Planning Area (PRC 6871.1 and PRC 6871.2(a), (b), (c) and (g)):

a) All those tide or submerged lands situated in the areas of the County of Los Angeles described as follows:

   Area No. 1. ...Point Fermin... in a general northerly and westerly direction... to the Ventura County line.

   Area No. 2. The tide and submerged lands surrounding the Islands of San Clemente and Santa Catalina...

b) All those tide and submerged lands being in the County of Santa Barbara any lying within... tract of land... belonging to the University of California, thence, Santa Barbara College... in a generally easterly direction... to a point distant 500 feet westerly from,... the eastern line of that certain tract of land deeded to Nino Brambilla...

c) All those tide and submerged lands being in the County of San Luis Obispo...

d) All those tide and submerged lands surrounding the Islands of Anacapa, Santa Cruz, Santa Rosa, and San Miguel...

f) Except as provided by Section 6871.2, the tide and submerged lands... which may be leased are those extending from the northerly city limits of the City of Newport Beach, Orange County to the northerly boundary of the State of California.

(c) Coastal Zone Management

The California coastal plan was completed in December 1975. This plan grew out of the 1972 Coastal Initiative (Proposition 20) which was adopted by the people of California. For a complete discussion on California's Coastal Zone Management Plan see Section IV.B.8.a.(1)(b).

(d) Ocean Dumping

Off the coast of Southern California are a variety of historic and active dump sites (see Table IV.B.10.a.(1)(d)-1). For a discussion of the various different types of dump sites see Section IV.B.7.a.(1)(d).

(e) Memorandum of Agreement Between the Department of Defense and the Department of the Interior on Mutual Concerns on the Outer Continental Shelf

Based upon the Memorandum of Agreement, the Departments of Defense and the Interior will begin coordination and consultation at the time of the Call for Information during the Environmental Impact Statement process. During this process the Departments will identify those areas which mineral exploration/ development and military activities conflict. During this period mitigation measures (deferral or stipulations) will be identified to resolve any conflicts.

(2) Projects Considered in Cumulative Impact Assessment

(a) Oil and Gas Activities

(i) State

There are 51 active leases on State offshore lands covering 161,000 acres. Twenty-nine are off Santa Barbara County, 10 are off Orange County and 12 are off Ventura County.

Nine platforms and seven production islands are presently operating on these leases. Four of the man-made islands are inside the Los Angeles/Long Beach Harbor Breakwater. State Lands officials anticipate that up to six additional platforms may be placed on State leases in the next few years (State Lands Commission, 1983). Also located within these leases are subsea completions.

TABLE IV.B.10.a.(1)(d)-1

SOUTHERN CALIFORNIA DESIGNATED DUMP SITES

Location		Depth	Content or Designated Waste
3141'N 11833'W	95nm SW of Pt. Loma	2000 M	Low level radio-waste (site not used)
	19m W of Pt. Loma	1260 M	Explosives
3233'N 11906'W	37m SW of San Clemente Island	400 M	Garbage and trash
3235'N 11717'W	5.4m W of Pt. Loma	90 M	Dredge spoil
3237'N 11721'W	6nm W of San Diego	200 M	Dredge spoil
3237'N 11724'W	8nm W of San Diego	130 M	Filter cake (perlite, cellulose)
3242'N 11737'W	Off San Diego	1200 M	Explosives & toxic chemical ammunition
3245'N 11737'W	20nm W of Pt. La Jolla	1200 M	Explosives & toxic chemical ammunition
3255'N 11917'W	Tanner/Cortes Bank	800 M	Drill cuttings
3255'N 11853'W		1900 M	Explosives & toxic chemical ammunition
33N 11815'W		--	U.S. Navy Emergency Ordinance jetison area
33N 11748'W		--	U.S. Navy Emergency Ordinance jetison area
3300'N 11855'W	17nm W of San Clemente Island	+1000 M	Conventional munitions
	20nm SE of Santa Catalina Island	--	U.S. Navy dump site
3317'N 11810'W	7.5nm E of S tip of Santa Catalina Island	800 M	Garbage & trasch
3317'N 11848'W	SW of Santa Catalina Island	1300 M	Explosives & toxic chemical ammunition

Table IV.B.10.a.(1)(d)-1 (continued)

Location		Depth	Content or Designated Waste
3317'N 11850'W	15nm SW of Santa Catalina Island	1500 M	Military explosives
3332'N 11755'W	4.1nm off Newport Bay	500 M	Dredge spoil
3332'N 11827'W	San Pedro Channel	1000 M	Industrial
3334'N 11828'W	11.5nm SW of Pt. Fermin	1000 M	Industrial
3337'N 11840'W		900 M	Toxics and chemicals (site not used)
3337'N 11818'W	5.8nm off Los Angeles Harbor	200 M	Dredge spoil
3338'N 11825'W	San Pedro	1000 M	Industrial
3339'N 11928'W	22m S of Santa Cruz Island	2100 M	Low level radioactive waste
3340'N 11932'W	21nm S of Santa Cruz Island	2100 M	Industrial
3340'N 11933'W	21nm S of Santa Cruz Island	2100 M	Low level radioactive waste
3341'N 11810'W		30 M	Dredge spoil
3405'N 11914'W	3.8nm off Port Hueneme	400 M	Dredge spoil
3407'N 11910'W	0.5nm off Port Hueneme	20 M	Dredge spoil
3438'N 12148'W	Point Arguello	4800 M	Explosive & Toxic Chemical Ammunition
3440'N 12150'W	Point Arguello	4000 M	Designated for Low Level Radioactive Waste
3440'N 12200'W	Point Arguello	4000 M	Conventional munitions
3521'N 12052'W	Morro Bay	20 M	Dredge spoil

Table IV.B.10.a.(1)(d)-1 (continued)

Location		Depth	Content or Designated Waste
3521'N 12102'W	Morro Bay	200 M	Dredge Spoil
3430'N 12250'W			Low Level Radioactive waste (not used)
3200'N 12130'W			Low Level Radioactive waste

Source: MMS Files, 1985

The last State offshore lease sale was held in 1969. The State Lands Commission had been authorized by the legislature to develop the programs necessary to lease approximately 40,000 acres of State tide and submerged lands for possible oil and gas development. These lands are located offshore between Santa Barbara County and Point Arguello and extend from mean high tide to the three-mile limit of the State's jurisdiction. The sale was planned for November 13, 1983, but an injunction issued by a California superior court judge has postponed the offering.

The following offshore fields contain platforms or production islands within the three-mile limit of the State's jurisdiction (See Table IV.B.10.a(2)(a)-1):

Conception Offshore Field: The Conception Offshore Field, east-southwest of Point Conception, is situated in State Leases PRC 2725 and PRC 2207. PRC 2725 was acquired by Texaco in 1961. On the lease is located an inactive platform, Herman, and 19 inactive subsea completions. A Final Environmental Impact Report (FEIR) has been prepared to allow the resumption of exploratory drilling on this lease. PRC 2207 was quitclaimed in 1975. A former platform, Harry, has been removed.

Carpinteria Field: The Carpinteria Field is situated in both Federal and State waters southeast of Santa Barbara. Within the State waters there are two leases, PRC 3150 and 4000. State Leases PRC 3150 and PRC 4000 were acquired by ARCO-Chevron in 1964 and 1966, respectively.

Platform Heidi: Is situated on PRC 3150 with one well completed on the adjacent lease PRC 3133. Platform Hope is also located on PRC 3150 with four wells completed in the adjacent lease, PRC 4000.

Cuarta Offshore Field: A portion of the Cuarta Offshore Field, east of the Conception Offshore Field, is contained in State Lease PRC 2206. PRC 2206 was acquired by Texaco in 1958. On the lease is one inactive platform, Helen, and nine idle wells. A FEIR has been prepared to allow the resumption of exploratory drilling within the lease.

South Ellwood Field: South Ellwood Field, southeast of Capitan, is contained in State Leases PRC 3242 and PRC 3120. These leases were acquired by ARCO-Mobil in 1965 and 1964, respectively. Platform Holly is situated in PRC 3242, while nine active wells are located in PRC 3120. A FEIR has been prepared to allow for the resumption of exploratory drilling on both leases.

Coal Oil Point: ARCO has submitted a plan of development to the State Lands Commission for Leases PRC 308 and 309 off Coal Oil Point. ARCO plans to use two platform complexes (each consisting of a drilling and a production plat-form) in order to develop the field. These platforms would be located in State tidelands near existing Platform Holly, offshore Ellwood.

Summerland Field: Summerland Field, southeast of Santa Barbara, was the first offshore field to be drilled. The field is located in State Lease

TABLE IV.B.10.a.(2)(a)-1

SUMMARY OF OIL AND GAS EXPLORATION AND DEVELOPMENT PACIFIC OCS

	Sales	BBO	TCFB	Expl. & Del. Wells (No.)	Devl. Wells (No.)	Platforms (No.)	Artificial Islands (No.)	Subsea Completion (No.)	Subsea Pipeline (No./Miles)	Marine Termina (No.)
Washington/Oregon	1	-	-	12	-	-	-	-	-	-
North California	1[a]	-	-	7	-	-	-	-	-	-
C. California	1[a]	-	-	12	-	-	-	-	-	-
South California										
Federal										
Existing[b]	9	0.310[e]	0.202[e]	310	545	16	-	-	18/55	1[i]
Proposed[c]	N/A	1.205	2.198	N/A	624[k]	13	-	-	10/50	-
State										
Existing[b]	*	1.914[j]	1.103[j]	*	115	7f	7[g]	39	14/34	17[h]
Proposed	*	.378[j]	.096[j]	186[d]	564	17[d]	-	*	*	*

Footnotes

*Unknown

(a) First Federal OCS oil and gas lease sale. Included areas in the northern, central, and southern California Planning Area.
(b) Existing infrastructure.
(c) Proposed infrastructure required to develop remaining reserves. Numbers are based upon proposed development plans.
(d) Proposed development is based upon hypothetical development scenarios.
(e) Cumulative production for the Southern California Planning Area as of August 1985.
(f) Number of platforms does not include Herman and Helen which are presently idle.
(g) Includes four artificial islands located inside the breakwater at Los Angeles-Long Beach Harbor.
(h) Does not include marine terminals inside ports and harbors.
(i) OS&T.
(j) California Department of Conservation, Division of Oil and Gas 1985. Estimated Reserves as of December 31, 1984.
(k) Assumes 48 Development wells per platform.

PRC 1824, and was acquired by Chevron-Exxon in 1957. Two platforms, Hilda and Hazel, are presently producing on this lease.

Rincon: The Rincon field is located northwest of Ventura. State Lease PRC 1466 was acquired by ARCO in 1955. Located on the lease is production island Rincon.

Belmont Field: The Belmont field is situated both onshore and offshore in the Long Beach area. Two State leases, PRC 186 and 3095, are located at the eastern end of the Wilmington trend, known as the Belmont Field. PRC 186 was acquired in 1945 by Exxon-Texaco. PRC 3095 was acquired by Chevron in 1964. Located on these leases are two production islands, Belmont (formerly called Monterey) (PRC 186) and Esther (PRC 3095). (Esther was severely damaged by a winter storm March 2, 1983. Reconstruction is expected to occur.)

Wilmington Field: Located west of the State leases are State granted lands which were transferred to the City of Long Beach. On these lands are four production islands, Grissom, Freeman, White and Chaffee.

Huntington Beach Field: The offshore portion of the Huntington Beach Field is located south of Huntington Beach. A portion of the field is contained in State Leases PRC 425 and PRC 3033. PRC 425 was acquired by Aminoil in 1950. PRC was acquired by Union in 1963. Two platforms, Emmy and Eva, are producing on these leases.

There have been announcements of finds in State waters off the coast of Santa Barbara County.

Union Oil submitted a Development Plan to the State for developing tract PRC 2879 which is lcoated in the Cojo Bay region near Point Conception. This development will involve the installation of Platform Hayley and pipelines on the tract.

Shell Oil is proposing to develop tract PRC 2920 with one platform. The Hercules platform site would be 13,000 feet offshore in the Gaviota Region in the Molino Field.

Phillips Petroleum plans to develop tract PRC 2933 for gas production, using only subsea completions. This tract is located east of Gaviota.

Among the other activities planned for State waters are the following:

Chevron is drilling on State Lease 3150, which it holds with ARCO.

Plans are underway to level Chevron's Island Esther in the Belmont offshore field off Long Beach. As stated previously, Esther was damage during a March 1983 storm. Plans call for Esther to be replaced with a platform with production expected by mid-1986.

Los Angeles Mayor Bradley approved a plan in January 1985 from Occidental Petroleum to drill for offshore oil from land in the Pacific Palisades. A civil action suit has been filed to block the plan.

(ii) Federal

There have been 10 Federal Lease Sales in the Pacific OCS Region: P1, P2, P3, P4, Sale No. 35, Sale No. 48, Sale No. 53, Sale No. 73, Sale No. 80 and RS-2 (see Table IV.B.10.a.(2)(a)-1). For a complete discussion of the history of the POCS Lease Sales see the Pacific Summary Report April 1985 (MMS, 1985). Table IV.B.10.a.(2)(a)-(1) contains a summary of the Pacific Region's oil and gas exploration and development activities.

Exploration from these leases is an ongoing process. An exploration well is drilled primarily for the purpose of determining if oil and gas actually exists in a structure. It is only after a well has been drilled into the formation that the presence of oil and gas can definitely be confirmed or denied. Currently, there are several exploratory rigs (jack-ups, drill ships, and semi-submersibles) off the Southern California and the Santa Maria Basin coast evaluating the oil and gas potentials from the previous sales. An average of 10 to 16 exploratory wells a year have been drilled since 1978.

Development wells are drilled after an exploratory well has confirmed the presence of petroleum in the formation. The majority of the Pacific OCS oil and gas discoveries have been made on tracts which were leased in 1968 and 1975.

There are presently 10 units/fields which have current or proposed oil and gas development.

Point Arguello Field: Three platforms have been approved for installation in the Point Arguello Field. Chevron's Platform Hermosa will be installed on Lease OCS-P 0316. Texaco is presently installing Platform Harvest on an adjacent lease, OCS-P 0315. Another platform will be installed by Chevron on Lease OCS-P 0450, to the north. An areawide EIR/EIS for the southern Santa Maria Basin was prepared jointly by the MMS and State of California. This areawide document addresses environmental impacts from the aforementioned platforms as well as potential development of an additional 22 leases in the southern Santa Maria Basin.

Santa Ynez Unit: The Santa Ynez Unit is a consolidation of 19 leases on the Federal OCS in the Santa Barbara Channel. Seventeen of these leases were acquired in the Lease Sale of 1968 and two in Lease Sale 48. The Hondo, Sacate, Pescado, and Government Point oil fields are located within the unit boundaries. Production from the Santa Ynez Unit was initiated on April 2, 1981 from Exxon's Platform Hondo. The Hondo platform will develop only the eastern portion of the Hondo Field. Exxon has submitted a development and production plan which calls for three to four additional platforms to develop the Sacate, Pescado, and western Hondo Fields. Oil from Platform Hondo is currently processed on an offshore storage and treatment vessel, a converted tanker.

Carpinteria Field: The Carpinteria Offshore Field southeast of Santa Barbara is situated in both Federal and State waters. Discoveries in State waters prompted the 1966 drainage sale by the Federal Government. Those development and production plans were filed for the field's development. Phillips' plan resulted in the installation of Platforms Hogan and Houchin on Lease OCS-P 0166, and Sun's plan resulted in the installation of Platform Henry on Lease OCS-P 09240.

Pitas Point Unit: The Pitas Point Unit southeast of Santa Barbara is composed of three leases, two of which were acquired in the 1968 Sale and the third in Sale No. 48. The first discovery on any of these leases, on OCS-P 0234, was an oil strike in 1968 but no oil development has occurred. A secondary discovery in 1978 was a gas strike. Texaco has installed Platform Habitat for the production of natural gas only.

Santa Clara Unit: The Santa Clara Unit southwest of Ventura is comprised of eight leases in the southeastern portion of the Santa Barbara Channel. The first discovery within the unit was in 1970. Presently, there are two platforms in the unit--Grace on Lease OCS-P 0217 and Gilda on Lease OCS-P 0216. Future development by Chevron will include the installation of a third platform, Gail on Lease OCS-P 0205, for which a development and production plan is being prepared.

Hueneme Offshore Field: The Hueneme Offshore Field southwest of Oxnard is located within two leases in the southeastern portion of the Santa Barbara Channel. Union is producing from the field with Platform Gina, located on Lease OCS-P 0202.

Dos Cuadras Offshore Field: The Dos Cuadras Offshore Field lies west of Carpinteria Field. The field is located in Sun's OCS-P 0240 and Union's OCS-P 0241, both 1968 sale leases. A series of discoveries in the field led to the installation of four platforms--A, B, C, and Hillhouse.

Beta Unit: The Beta Unit is comprised of four leases southeast of Huntington Beach and includes two oil fields--Beta and Beta Northwest. Only Beta is being developed. The discovery well was drilled in 1976. Shell, the unit operator, installed Platforms Ellen and Elly on Lease OCS-P 0300 in 1980. Platform Elly's function is to treat production from Platform Ellen; Elly has no drilling capability. Shell installed Platform Eureka on Lease OCS-P 0301 in 1984. Chevron, Shell's designated agent on Lease OCS-P 0296, installed Platform Edith in 1983.

Point Pedernales Field: Two platforms have been approved for the development of the Point Pedernales Field. Union's Platform Irene is being installed on Lease OCS-P 0441, with Exxon's Platform Independence scheduled for installation in 1986 on Lease OCS-P 0440. The first discovery well for the field was spudded on OCS-P 0441, a Sale 53 lease, in November 1982. An areawide EIS/EIR was jointly prepared by the MMS and State of California which covers the Union/ Exxon projects and other, potential development in the central Santa Maria Basin area.

San Miguel Field: One platform has presently been proposed to develop San Miguel Field. Cities Service's Platform Julius is scheduled for installation in 1986 on Lease OCS-P 0409. The discovery well was spudded on this Sale 53 lease in November 1982. An areawide EIS/EIR is being prepared by the MMS and State of California which will cover the Platform Julius project and other, potential development in the northern Santa Maria Basin area.

There are four additional units which as yet do not have proposed development.

Rocky Point Unit: Chevron is the operator of the Rocky Point Unit, which involves seven leases (OCS-P 0317, 0318, 0447, 0448, 0451, 0452 and 0453) adjacent to the Point Arguello Field leases. Pre-DPP surveys are being per-formed by Chevron.

Santa Rosa Unit: The Santa Rosa Unit is located in the eastern portion of the Santa Barbara Channel and is comprised of two leases, OCS-P 0232 and OCS-P 0238, and a portion of another, OCS-P 0231. A suspension of operations is in effect for the three leases until September 11, 1985. Exploratory activity in the vicinity of the unit is continuing.

Sword Unit: Conoco is the operator of the Sword Unit, which includes parts of four leases-OCS-P 0319, 0320, 0322, and 0323. As suspension of production covering these Sale 48 leases located west of Point Conception will be in effect until November 30, 1985. Exploratory activity is continuing.

Wilson Rock Unit: Chevron is the operator of this two-lease unit located northeast of San Miguel Island. OCS-P 0348 and 0349, Sale 48 leases, are under a suspension of production until August 31, 1986. Exploratory activities are continuing in the unit.

(b) Oil and Gas Infrastructure

(i) Refineries

At the refineries crude oil undergoes several processing stages, including separation, conversion and treatment. Refineries range in size from small plants capable of processing only 190 barrels of crude per day to complex facilities which process more than 500,000 barrels per day. For a list of the refineries and their capabilities see Table IV.B.10.a.(2)(b)-1.

(ii) Marine Terminals

Table IV.B.10.a.(2)(b)-2 contains a listing of marine terminals in the Southern California Planning Area.

(iii) Support/Supply Bases

The Port Hueneme Harbor has a mean low-water depth of 35 feet and is relatively maintenance free with respect to dredging requirements.

The Port recently purchased additional wharf space from the U.S. Navy, including 650 feet of existing wharfage plus 700 feet that will be dredged. The additional dock and wharf space adds about 18 acres to Port Hueneme.

TABLE IV.B.10.a.(2)(b)-1

REFINERIES PROCESSING OFFSHORE OIL SOUTHERN CALIFORNIA PLANNING AREA

Refinery Location	Operating Crude Oil Capacity (bpcd)
Chevron U.S.A. Inc. - El Segundo	405,000
Golden West Refining Co. - Santa Fe Springs	40,600
Mobil Oil Corp. - Torrance	123,500
Texaco Inc. - Wilmington	75,000
Union Oil Co. of California - Wilmington	108,000

TABLE IV.B.10.a.(2)(b)-2

MARINE TERMINAL IN THE SOUTHERN CALIFORNIA PLANNING AREA

County	Location	Terminal Operator	Function/status
Santa Barbara	Cojo Bay (Point Conception)	Union	Loading crude oil
	Gaviota	Texaco (formerly Getty)	Loading crude oil
	Elwood	Aminoil	Loading crude oil
	Carpinteria	Chevron	Loading crude oil and unloading product
	El Capitan	Exxon	Not operating
Ventura	Ventura River	Texaco (formerly Getty)	Loading OCS and other crude oil and natural gasolines
	Ventura	Union	Loading OCS and other crude oil
	Mandalay Beach	Southern California Edison	Unloading fuel oil
Los Angeles & Long Beach	El Segundo (4 terminals)	Chevron	Unloading crude oil and loading product
	Los Angeles Harbor	Union	Unloading crude oil and loading product

Table IV.B.10.a.(2)(b)-2 (continued)

County	Location	Terminal Operator	Function/status
Orange	Huntington Beach	Gulf	Unloading crude oil
San Diego	Encina	San Diego Gas and Electric	Unloading fuel oil
San Luis Obispo	Estero Bay	Chevron	Loading crude oil
	Port San Luis	Union	Loading crude oil

Source: MMS, 1985.

Construction is expected to begin in 1985 and completed by mid-1986. This expansion and improvement project is part of the port's planned growth and will allow for an expansion of 80 percent (or 251 ships) over the harbor's 1982 usage.

The Coastal Services Corporation held a preliminary application meeting with the Santa Barbara County Energy Division staff to discuss their plans for an industry-wide supply base near Point Conception (MMS, 1985). The supply base would provide warehousing and open storage for bulk commodities as well as loading facilities for boat transport to the platforms.

The Port of San Luis is perhaps the most likely candidate for a support facili-ties for the southern Santa Maria Offshore Basin. However, the port's expressed policy is that the harbor is available for OCS vessel use in emergencies. Possible solutions to allow regular OCS vessel traffic include building a new pier or using Union Oil's pier commissioned in November 1984 and currently used to transfer petroleum products.

(iv) East-West Pipeline Projects

Celeron - All American Pipeline:

Celeron Pipeline Company and All American Pipeline Company, subsidiaries of Goodyear Tire and Rubber Company propose a project which consists of a 1,170-mile long pipeline from Emidio, California to McCamey, Texas, plus an approximate 500-mile extension in Texas to Freeport. The Celeron Pipeline Company would build an additional 12-mile link from Las Floras Canyon to Emidio, via Gaviota, All American Co. would build the leg from McCamey to Freeport.

The pipeline is expected to have a 30-inch diameter with a capacity of 300,000 bpd. Celeron-All American anticipates that the pipeline will be in operation by early 1987.

Southern California Pipeline System (SCPS):

The Southern California Pipeline System (SCPS) project proposes to transport crude oil from Santa Barbara County to Emidio in the San Joaquin Valley and to refineries in the Los Angeles Basin. This project is planned by a consortium of four operators: Four Corners Pipeline Company, a subsidiary of Atlantic Richfield Company; Chevron Pipeline Company; Texaco USA, and Shell Oil Company. The 30-inch diameter line is expected to transport 200,000 bpd and would allow for the addition of about 130,000 bpd entering from the San Joaquin Valley. In mid March 1985, SCPS announced that it had assimilated a similar Texaco plan for a line from Santa Barbara County's southern coast to Los Angeles and the San Joaquin Valley.

Texaco's (formerly Getty's) plans proposed a 100,000 to 400,000 bpd pipeline from Gaviota to the San Joaquin Valley. On April 9, 1985, the Santa Barbara County Planning Commission conditionally approved the SCPS project.

Pacific Texas Pipeline Co. (Pactex) proposes to construct and operate a crude oil transportation system between Los Angeles, California and Midland, Texas. The proposed pipeline and related berthing/terminal facilities would receive crude oil from Alaska, California and Pacific rim countries and transport up to 900,000 barrels per day (bpd) of crude oil to Midland, Texas (Los Angeles Harbor Department, et al., June 1985).

Pactex has proposed to operate its pipeline as a common carrier, as authorized by Interstate Commerce Commission Provisions (19 USCA Section 10501). The proposed Pactex pipeline would follow the same general route as a previously proposed project by Standard Oil Company of Ohio (SOHIO).

(c) Vandenberg Air Force Base

Expansion of Vandenberg Air Force Base: The space shuttle and the MX programs have created the need for expansion of Vandenberg Air Force Base. The space shuttle program calls for the ability to launch the orbiter in a polar orbit in addition to the equatorial orbit. Restrictions on overflight of land during the ascent limits launches at the Kennedy Space Center to equatorial orbits. Launching from Vandenberg Air Force Base will permit the orbiter to be placed in a polar orbit, which is the preferred orbit for numerous defense, communications and other scientific purposes (Dept. of Air Force, 1978a).

Vandenberg is the only site in the continental United States from which operational land-based intercontinental ballistic missiles and polar orbiting space satellites are launched (Dept. of Air Force, 1978b).

The expansion for the space shuttle will be restricted to constructing new facilities and modifying existing facilities, all at the Air Force Base. These include modification to the landing and taxiing facilities, modification of the tow route between the support facilities and the launch complex, modification of the launch facilities, and modification of the Pt. Arguello Boat House.

The MX program calls for the missile flight testing to take place at Vandenberg Air Force Base. The expansion will be restricted to construction of new facilities and the modification of existing facilities. The construction and modifications include a rail transfer facility, a mechanical maintenance facility, an integrated test facility, a payload assembly building, stage modification facility, stage storage pads, a processing facility, a missile assembly building and the basing mode test facility.

All the expansion will take place within the perimeter of the Air Force Base. Impacts resulting from the expansion to sewage and water supply will occur on the Base, but will not affect the local area. Air quality is not expected to be affected significantly by the expansion.

Expansion of the Vandenberg facilities is expected to be completed by 1985. The space shuttle and MX programs will result in direct non-military employment at Vandenberg, increasing from 10,631 to 14,799 between 1980 and 1988.

The main impacts to the local area will be the increase in population and the increase in local traffic flow. Population is expected to increase by 12,500 for the area in the vicinity of Vandenberg. The increase in population resulting from Vandenberg expansion is expected to settle primarily in Lompoc and Santa Maria. The expected increase will peak in 1985 and level off in 1988 with the permanent net change being an increase of 8,500 people.

The increase in population will put additional pressure on public services in the Vandenberg area. Water demand is already overdraughting the water supply from the Arroyo Grande groundwater basin. Wastewater treatment facilities are adequate to accommodate only some growth.

Housing availability is limited in the area in all price ranges, but especially in the low and moderate ranges. The increase in population will increase the demand for housing causing a possible conversion of rural acreage to urban housing along with the associated commercial and public services and facilities uses.

Two potential conflicts between the shuttle and offshore development will occur down range from the launch site. The first is from the overpressure resulting from the sonic booms created during normal ascent. The shuttle has a potential of a 30 psf overpressure at the center of the focal zone which would be about 40 miles down range (Dept. of Air Force, 1976). Overpressures of these values could cause minor damage to ships at or near the center of the focus effect. Clearing of craft from down range hazardous zones is one of the prelaunch safety measures. In the event of offshore structures this would mean either evacuating the personnel from the structure or providing a suitable shelter on the structure.

The other conflict, which is the major conflict, is due to the solid fuel boosters which are jettisoned during ascent. Normally these will be released about 150 miles downrange and will parachute into the ocean where they will be recovered for reuse. In case of an aborted launch, the booster could fragment, and pieces weighing in excess of 300,000 pounds could be impacting the surface. These fragments each have a potential explosive force on surface impact that is sufficient to exceed the accepted overpressure threshold of physiological damage for exposed personnel. This requires that all personnel either be evacuated or sheltered, as is recommended because of the sonic boom overpressure. In addition these fragments could cause considerable damage to any structure that was contacted.

(d) Ports of Los Angeles and Long Beach

Ports of Los Angeles and Long Beach Expansion: The Ports of Los Angeles and Long Beach are the main marine transportation terminals for Southern California. The Ports serve approximately 30,000 vessels of all types each year of which 7-8,000 are commercial vessels. Due to the continual demand for faster turn-around, more traffic, etc., there is a continual expansion program going on in the Port facility.

One of the proposed expansion projects is the Los Angeles Harbor coal terminals. This entails a 190-acre landfill site and the dredging of the channel to 65 feet to accept deep draught ships. The proposed coal terminals are expected to handle up to 15 million tons of coal each year. The primary market for the coal passing through the San Pedro Bay harbors will be the Pacific Rim countries.

(3) Physical Environment

(a) Impact on Water Quality

Water quality in the Southern California OCS will be impacted by a variety of liquid and solid wastes that are associated with offshore oil and gas exploration and development. These wastes were characterized and their general impacts on water quality were described in Section IV.B.7a.(3)(a).

The primary impact producing agents that affect water quality that are associated with the proposal include 1) drill muds and cuttings, 2) produced water, 3) sediment resuspension, and 4) accidental oil spills. The remaining discharges and leachable materials mentioned above are of secondary and minor importance because of their small volume, small concentration or temporary occurrence. Domestic and sanitary wastes are treated by an activated sludge system and are chlorinated before discharge. Effects from such domestic and sanitary waste discharges can not be measured a few meters from their dishcarge point and are, therefore, negligibile.

An estimated 3 m bbl of drill muds and cuttings would be discharged from the proposed southern California development. Mixing and dilution of the of the discharge plume from 10 platforms would depend on the rate of discharge, discharge depth, and existing hydrographic conditions. Dilutions of 1,000-fold are expected within several meters of each discharge and very low concentrations are expected within 2,000 meters downcurrent [see Section IV.B.7.a.(3)(a)]. Localized turbidity from the plumes would reduce light penetration and, therefore, photosynthesis. Solids may accumulate on the bottom beneath the discharge plume and bury sessile benthic organisms directly or cause changes in sediment characteristics and subsequently result in changes in the benthic community.

Acute toxicity from the drilling muds and cuttings is not expected because of rapid mixing, and because drilling fluids have low toxicity (Neff 1985). Chronic or sublethal effects may include bioaccumulation of metals by some organisms (See Ch.IV.B.7.a(3)(a) for further discussion). However, long-term effects (e.g., changes in behavior, metabolism or reproduction), if any, would be restricted to areas near the platforms.

A total of about 346 m bbl of produced water containing particulate matter, hydrocarbons, dissolved inorganic ions and metals, with characteristically low dissolved oxygen, low PH and high salinity, would be discharged from the 682 exploration and development wells. These discharges pose little threat to the marine environment. Numerous studies (summarized in Boesch and Robalais 1985) suggest that produced waters are virtually non-toxic. Although field work indicates the potential for bioaccumulation of petroleum hydrocarbons from undiluted produced waters, mixing and dilution would be very rapid after discharge and organisms would be little affected. Impacts from produced waters are considered to be low for the region, but adjacent to the platforms (from a few meters to several hundred meters), impacts will be moderate because of measurable increases in trace metals and dissolved hydrocarbons.

Bottom sediments will be disturbed during exploration and development activities associated with platform and pipeline installation. Sediment resuspension will cause turbidity plumes and result in reduced sunlight penetration and a decrease phytoplankton growth if the turbid water occurs in shallow waters, i.e., <100 meters. Some sessile organisms will be buried directly, especially during pipeline trenching when relatively large quantities of sediment will be displaced. Resuspended sediment that was previously polluted with hydrocarbons, metals or pesticides might be a source of contamination for organisms exposed to the sediment plume. Impacts associated with sediment resuspension are short-term, localized and are considered low impacts.

Two accidental oil spills exceeding 1,000 bbl is expected (estimated number and probability, 1.39 and 0.75, respectively) as a result of the proposal. As indicated in Section IV.B.7.a(3)(a), the fate and effects on water quality of a spill depend upon a number of factors including the spill's size, location, proximity to shore, season, and sea and weather conditions. In the open ocean and in moderate to high seas, a spill is rapidly dispersed and "weathered" by physical and biological processes such as evaporation, oxidation, emulsification, and uptake and metabolism by marine organisms. Over deep waters, some components of the oil would eventually reach bottom sediments in low concentrations, and potentially over a wide area. Spilled oil might persist for long periods if the oil residues reached shore and were driven into beach sands or estuarine sediments and were subsequently covered and uncovered during normal tidal exchange. Degradation in water quality over the extent of the spill area could range from a moderate impact for a small spill in the open ocean to a very high impact for a large spill. Two oil spills of 1,000 are assumed as result of the proposal, which would have high impacts if the oil became entrained in calm bays and estuaries where it might persist for many months.

CONCLUSION: Overall, low impacts are expected from the proposal for the region. Localized areas adjacent to the platforms and pipeline routes and downstream of platform discharges are expected to have moderate impacts.

CUMULATIVE IMPACTS: Water quality for most of the southern California planning region remains good, but exceptions occur within several kilometers of existing municipal outfalls and within several hundred meters of existing oil and gas activities where drilling muds and cuttings, formation water, and resuspended sediments cause moderate impacts. Similar impacts are expected from the proposed OCS petroleum exploration and development. Impacts on water quality would include the cumulative effects of 56 platforms (29 existing), including their associated operational discharges, and the increased likelihood and number of accidental oil spills. An estimated 1.5 X 107 bbl of muds and cuttings and 2.1 X 108 bbl of formation waters would be discharged during the lifetime of potential oil and gas development off southern California. The total number of oil spills expected from all sources would be 13 and the probability of one or more spills greater than 1,000 barrels occuring is estimated to be 99%. Impacts could be very high if significant quantities of oil reached sensitive areas offshore.

Ocean water quality of the southern California region is already impacted by existing muncipal and industrial waste discharges, runoff from streets and agricultural lands, commercial shipping and recreational boating, natural petroleum seeps, and aerial fallout. The most important sources of metals, hydrocarbons and other toxicants to ocean waters off southern California are municipal discharges totaling over 9.5 X (10)'(9) bbl/year (Bascom 1982). Municipal outfalls discharge some 2.6 X (10)'(5) metric tons/year of solids, 4.5 X (10)'(4) metric tons/year of oil and grease, and over 2,000 metric tons/year of metals (Southern California Coastal Water Research Project 1980). Bascom's (1982) review of the impacts of southern California's two major muncipal discharges, in Santa Monica Bay and at Palos Verdes (which carry about 85% of all municipal wastes discharged to southern California ocean waters), indicates that benthic communities sur-rounding the outfalls are significantly degraded over areas of 3 and 9 km2, and measurably changed over areas of 18 and 85 km2, respectively. Similarly, the size of benthic areas changed by municipal outfalls off San Diego and Orange County are 4 and 10 km2, respectively; no change was evident surrounding the Ventura outfall.

CONCLUSION: Municipal wastewater is the major cause of water quality degradation and is the primary source of toxicants to southern California ocean waters. On a regional basis, cumulative impacts will be low for the entire planning area. The impact to water quality of potential oil spills is considered to be moderate locally.

(b) Impacts on Air Quality

Air quality impacts are estimated based on the discussion presented in Section IV.B.7.a.(3)(b). Exploratory drilling operations would result in a temporary emission source for a limited duration in any one area. Emissions would primarily consist of nitrogen oxides. Pollutants drifting onshore would be very localized, and concentrations would be below DOI Significance Levels. Maximum one-hour average concentrations of nitrogen dioxide (NO2) would be within the California ambient standard, except in some areas in the Los Angeles Basin where the NO2 State Standard is occasionally exceeded due to existing emission sources (See Table III.C.4.8).

Development and production activities associated with the offshore platforms would result in generally small, localized increases in air pollutant concentrations (See Table IV.B.7.a.(3)(b)(1 thru 4) for typical emission levels and DOI significance levels). These concentrations would in most cases be below the DOI Significance Levels. However, for some platforms located near shore, average annual concentrations of nitrogen oxides could slightly exceed the DOI Significant Levels. These facilities would be required to install pollution controls. Possible control measures were discussed in Section IV.B.9.a.(3)(b). These mitigation measures would be sufficient to prevent any significant impacts on air quality from inert pollutants.

Photochemical trajectory modeling performed for emissions from oil and gas production platforms indicated the potential exists for an increase in ozone levels, particularly if oil is shipped by tanker (FSI, 1983). One of the potential contributors to ozone formation, fugitive hydrocarbon vapor emissions, can be controlled very effectively by use of a vapor recovery system during crude oil transfer operations and by an inspection/ maintenance program to reduce leaks from valves and seals. However, the effect of offshore oil and gas development activities on onshore ozone is not known with much certainty. The potential effect of nitrogen oxide emissions from platforms on onshore ozone levels is not well understood. Several studies are presently ongoing to determine the effects of offshore oil and gas development on ozone levels. Since many of the potentially affected areas are presently nonattainment for ozone, and are likely to remain so in the future, new offshore projects may need to be subject to emission controls so that adverse effects would be avoided.

Onshore air emissions would result from new and expanded oil and gas processing facilities in San Luis Obispo, Santa Barbara, and San Diego Counties and new tanker terminal in San Luis Obispo and San Diego Counties. Typical emissions rates for facilities are described in Table IV.B.7.a.(3). All onshore facilities would need to conform to the applicable local air quality regulations administered by the air pollution control districts (APCD). In attainment areas, the Prevention of Significant Deterioration (PSD) regulations apply, while in nonattainment areas, the local New Source Review (NSR) standards are enforced. The expected new gas processing facility and tanker facility in San Luis Obispo County could be accommodated within the local air quality rules and would not significantly affect air quality. Expansion of oil and gas processing facilities in Santa Barbara County would be subject to the NSR standards, which requires stringent air emission controls and emission offsets. Only limited emission offsets are available in Santa Barbara County. The scarcity of offsets makes approval of new or expanded facilities more difficult and may necessitate expensive emission controls or offsets. An expansion of onshore facilities may also preclude other possible industrial developments. Similar rules would also apply to a new gas processing plant and a tanker facility in San Diego County. The availability of offsets in San Diego County is not known.

Refineries in the Los Angeles Basin may have to be retrofitted in order to be able to process OCS crude oil. Any additional emissions may have to be offset. As a result, the capacity to refine OCS crude oil in the Los Angeles Basin may be limited, and the oil produced by the proposed lease sales may have to be transported to alternative locations.

The proposed project would not significantly affect air quality in Federal attainment areas. A few areas located in Federal nonattainment areas may be adversely affected due to a potential increase in ozone concentrations (See Table III.C.4.a.(8) for a description of attainment and nonattainment areas in southern California). Onshore facilities may be required to apply stringent emission controls and emission offsets.

CONCLUSION: Impacts on air quality would range from low regionally to moderate localy. See Chapter VIII.A. for a complete list of air quality impact level definitions.

CUMULATIVE IMPACTS: Impacts on air quality were considered by including all other future projected offshore and onshore projects (See Ch.IV.B.10.a.(2) for a list of projects and proposals. The cumulative impacts consider a total of 56 platforms, new or expanded gas processing facilities in San Luis Obispo, Santa Barbara, Los Angeles, and San Diego Counties, and new or expanded tanker facilities in San Luis Obispo, Los Angeles, and San Diego Counties.

Emissions from offshore production platforms would generally result in small, localized increases in air pollutant concentrations as described in Ch.IV.B.7.a.(3)(b). These concentrations would in most cases be below the DOI Significance Levels. However, for some platforms located near shore, or located in close proximity to each other, average annual concentrations of nitrogen oxides could exceed the DOI Significance Level. These facilities would be required to install pollution controls. Possible control measures were discussed in Section IV.C.9.a(3)(b). These mitigation measures would be sufficient to prevent any significant impacts on air quality from inert pollutants.

Production platforms may have a potential for causing an increase in ozone levels, particularly if oil is shipped by tanker (FSI, 1983). Since a significant portion of the potentially affected areas will likely remain nonattainment for ozone, platforms may be subject to emission controls so that adverse effects would be avoided.

An onshore gas processing facility in San Luis Obispo County could be accommodated within the local air quality rules and would not violate any ambient air quality standards. However, it would result in a localized increase in air pollutant concentrations (See Table IV.B.7.a.(3)(b) for typical emission rate). This may restrict other potential industrial development in the vicinity of the facility. Expansion of oil and gas processing facilities in the other counties would be subject to stringent emission controls and emission offsets. Available offsets are scarce in many areas, which may make approval of new or expanded facilities difficult, and may necessitate the use of expensive emission controls. Expansion of onshore facilities may therefore preclude other industrial developments as potential offsets are used up.

Refineries in the Los Angeles Basin may have to be retrofitted in order to be able to process OCS crude oil. Offsets may be required for any additional emissions resulting from increased refinery output or refinery retrofitting. Los Angeles Basin refineries may therefore have a limited capacity for refining OCS crude oil and some of this oil may have to be transported to alternative locations.

The proposed lease sales would not significantly increase onshore air pollutant concentrations. However, increased air emissions would have the potential of causing increased ozone levels. Offshore platforms may be required to apply emission controls. Many onshore facilities may be required to apply stringent emission controls and obtain emission offsets. Impacts or air quality would therefore range from low (a few areas within a Federal attainment areas will be impacted by both onshore and offshore sources) to moderate (a few areas within a Federal nonattainment areas will be impacted by both onshore and offshore sources; some emission controls and/or offset costs are likely).

CONCLUSION: The cumulative effects of the proposal would cause moderate air quality impacts.

(4) Biological Environment

(a) Impacts on Plankton

The impact on phytoplankton and zooplankton in the planning area will come from drilling muds, formation water (if it is discharged) sewage, and spilled hydrocarbons (See IV.B.10.a. for a description activities and volumes of discharges). These agents and their effects on plankton have been discussed further in Section IV.B.7.a.(4)(a) of this document. The deleterious effects of oil and gas activity especially oil spills, on plankton populations, is felt to be insignificant, due to the spatial and temporal variability of plankton to the marine environment.

The impacts to plankton caused by the 207 exploratory wells and 475 development/production wells on 10 platforms would be very low (Individuals of a population become subject to sub-lethal effects and the consequences of which do not persist) and only within the water pockets impenitrated by drilling muds, formation waters, sewage and small oil spills.

It is estimated that two (1.39) oil spills greater than 1,000 barrels will occur in the planning area. The probability of one or more large 1,000 bbl or greater spills occurring is 75 percent. Should a large spill occur, impacts to plankton would be low within the water mass. contacted by the spill. The overall impact to the plankton population would be very low. If a large spill becomes trapped within an eddy system, impacts would be moderate As indicated earlier this is very unlikely.

CONCLUSION: Impacts to plankton from normal operations will be low within the local area of the water mass affected. The impact on the overall plankton population of the area would be very low.

CUMULATIVE IMPACTS: The total number of large 1,000 bbl or greater spills from all furture, past and present oil activities is 13 (12.16) with a 99 percent probability of one or more large spills occurring. Impacts to the plankton population of the area would remain very low even if oil spills occurred a few months apart because impacts would be limited to the water pockets impacted by oil with the plankton unaffected outside of these local areas. The same would probably be true with impacts caused by the 56, present, future and existing platforms. Impacts would remain very low since the plankton would be limited to relatively small water pockets within which muds are entrained.

CUMULATIVE IMPACT CONCLUSION: Impacts would remain very low to water mass entrained plankton populations from the platforms and remain very low for the entire planning area. Impacts in the local area affected by oil spills would be low.

(b) Impacts on Benthos

(i) Intertidal

Oil spills from platforms or tankers and the movement of equipment during installation of pipelines at landfall locations could cause impacts to intertidal shorelines. Routine operations of drilling platforms and related activities are not expected to cause impacts to intertidal communities, all of which are three or more miles away. During pipeline installation damage to the communities within an area about 20 m wide would occur where the pipeline comes ashore. Recovery from this type of disturbance should proceed normally within 2 years and with no toxic residues left in the area from the operation.

Most of the descriptive and intertidal community analysis as well as much of the oil spill impact studies have been done in southern California. A more complete description of the generic impacts is given in the central California section (Ch.IV.B.9.a.(4)(b)). For a discussion of the numbers of wells, platforms, muds and cutting and formation waters estimated for the proposal see Ch.IV.B.IO.a.

Most rocky intertidal areas would be expected to begin recovery within a year after the disturbance, and reproductive maturity achieved within five years. Isolated locations which have been heavily affected could be retarded in recovery for possibly a year because larvae and spores from impacted species would have to come from areas outside the impacted area rather than from within it. This condition is particularly true of the brown algae which have limited dispersal abilities. Once repopulation commenced, recovery would proceed normally, although other dominant species could outcompete the original species as a result of advantageous settling times.

The extent of damage to a sandy beach intertidal community from a large spill will be less than that to a rocky intertidal community.

It is estimated that two (1.39) oil spills greater than 1,000 barrels will occur in the planning area. The probability of a large 1,000 bbl or greater spill occurring is 75 percent. As discussed previously in Ch.IV.B.9.a.(4)(b), should a large oil spill occur and contact a rocky intertidal habit, the impacts will vary from moderate for the areas described in Ch.III.C.4. as being more sensitive than the norm and low for the other areas. Impacts would be local, the planning area would not be altered overall. Impacts to sandy beach intertidal areas from a large oil spill would vary from low for step sloping beaches to very low on long gently sloping beaches.

CONCLUSION: Intertidal areas will not experience impacts from normal production. An oil spill will cause low impacts for most rocky intertidal areas and moderate to more sensitive rocky intertidal areas. Sandy beaches would experience very low impacts on short steep beaches and low impacts on long gently sloping beaches from a large oil spill. The impacts would be local, no alteration of the planning area overall would occur.

CUMULATIVE IMPACTS: The total number of large 1,000 bbl or greater spills from all future, past and present oil activities is 13 (12.16) with a 99 percent probability of one or more spills occurring.

The impacts from a large oil spill reaching intertidal areas would remain low for most rocky intertidal and some sandy beach areas and moderate for more sensitive rocky intertidal areas. If two or more spills were to contact a rocky intertidal area on consecutive or alternate years, the impact would be very high. This essentially means that recovery would require over 10 years. Although estimation of the probability of such an occurrence is beyond the scope of this analysis, previous OSRAM model runs reveal that multiple oil spill strikes of the same coastal segment are extremely unlikely.

CONCLUSION: The impacts from one or more large oil spill reaching intertidal areas would remain low for most rocky intertidal and some sandy beach areas and moderate for more sensitive rocky intertidal areas.

(ii) Subtidal

Activities which may adversely impact subtidal dwelling organisms include: emplacement of drilling platforms, discharge of drill cuttings and muds, pipeline construction, and oil spills.

For additional coverage of oil production related impacts on subtidal benthos, refer to BLM (1975, 1979, and 1980).

Impacts from platforms and drilling muds and cuttings are discussed together because they impact the bottom in the immediate vicinity of the platform. The soft bottom community can be altered for over 100 meters from the edge of the platform (Wolfson et al. 1979) for at least the life of the platform. This is caused by organisms, especially mussels, attached to the platform which grow to large size and eventually fall off, creating a different bottom substrate beneath the platform. The fallen mussels attract large numbers of predators, particularly starfish, to the area. Beyond the mussel pile, the nature of the substrate is changed by the fallout of bits of shells, barnacle tests, hydroid tubes, etc. from the platform community. This favors the development of abnormally large populations of the polychaete worm Diopatra ornata to at least 100 m (Wolfson et al., 1979).

The area impacted by drill cuttings will vary slightly with depth and current velocity. The majority of heavy cuttings together with some entrained drilling muds will quickly settle to the bottom, form a pile which may be several feet thick under the platform, and gradually decrease away from it. Within a radius of 100 meters of the platform or rig, benthic organisms can be buried. The sediment composition of the bottom can be altered and impacts to benthic communities can occur to 150 meters (Menzies et al., 1980). As a conservative estimation these impacts could possibly extend to 1,000 ft (380 meters).

The area of bottom covered by drilling muds will vary significantly with depth and currents. Menzies et al. (1980) reported impacts on benthic communities for distance of 800 meters. As a conservative estimate, we assume the maximum distance for sublethal, but detectable, impacts on benthic assemblies from drilling muds is 1,000 meters.

In the case of production platforms, the communities within sediment bottoms probably will recolonize after a period of time; however, the every species of the colonization may not be by organisms characteristic of the surrounding areas. Recolonization will come both from within the buried sediments and from outside larval settlements. Impacts from drilling muds and drill cuttings are of shorter duration than permanent platforms and are probably of less consequence. However, the impacts occur concurrently at least as long as wells are drilled from the platform, or about 20 years.

A significant interference with ecological relationships for less than 2 years will occur in the immediate vicinity of the platform on the bottoms which are recolonized by original species in addition to the organisms which fall from the platforms. However, since impacts will probably remain localized, the impact to the generally soft bottom outside the impacted area will be short term, lasting less than 1 year, with insignificant interferences with ecological relationships.

Platforms could also alter the assemblages on hard bottoms for a radius of at least 100 meters. As with soft bottoms, impacts are caused by organisms falling from the platform structure and creating a different bottom surface and assemblage and drilling muds and cuttings. If platforms are concentrated on hard bottom reefs, such as Tanner and Cortes Banks, the ecology of the entire hard bottom area could be altered, resulting in a significant ecological impact.

The proposal is expected to result in 682 exploration and production wells. Muds and cuttings discharged could reach 3 m bbl and formation waters could be 346 m bbl. The highest impacts from drilling muds and cuttings to hard bottoms will be in those areas where the currents are weak. In these areas, the highest concentrations of muds and cuttings will pile up and settle at the drilling site. Where the cuttings and muds pile up, the composition of the bottom will become altered and most sessile organisms will be buried within a radius of 100 to 380 meters around the platform or rig. Because the bottom substrate may change following the discharge of muds, cuttings, and associated impacts from platforms, recolonization will consist of species different from the original inhabitants. If platforms are not concentrated on hard bottoms, the resulting impacts are expected to have a significant interference with ecological relationships which last for two or more years. Additional, probably small, impacts on bottom organisms are possible within 800 to 1,000 meter circumference from the platform.

Pipelines may disturb soft bottoms for an area 20 meters wide along their axis. Anchors may also cause a disturbance from being dropped and pulled along the bottom when pipelines are being layed. The disturbance will not be continuous from pipeline to anchor, but will occur at a horizontal distance of 3 to 7 times the depth of the anchor. Trenches and mounds which apparently can remain for over a year in certain soft bottoms result from this procedure. In bottoms consisting of coarser sediments, like sand, the mounds and trenches probably do not remain as long. Assuming the composition of the bottom sediments remains the same from the pipeline or anchor disturbance, impacts to the soft bottom communities would be short term.

Pipelines transversing hard bottoms would cause disturbances of the same dimensions given above for soft bottoms. Attached organisms could be crushed by the pipelines or anchors and repopulation may have to come primarily from larval settlement. The time required for the community to recover to its original population structure (species distribution and size and age distribution within the species) could be from one year for kelp, to approximately 10 years for mussels.

Impacts from a large oil spill, caused by smothering and toxic fractions of the oil, on soft bottom communities generally would be low. This would be particularly true at deeper bottoms where dilution of the oil would be greater before it reaches the communities on the bottom. There is a possible danger of mortality to more sensitive species, particularly microcrustaceans.

Numerous endemic species are found in the proposed sale area. The implication of this is that severe or chronic alteration of comparable areas of the environment could eliminate endemic species forever. It is doubtful that a single large spill or several platforms could wipe out many of any subtidal benthic species by itself. The effect of widespread chronic oil pollution or a large oil spill in combination with other types of environmental alterations is not known, but could contribute to the extinction of some of these endemics. The area having the highest concentration of endemics is the Santa Barbara Channel which is also the area of most oil activity.

Some of the smaller shrimp and crablike organisms (microcrustaceans) are reported to be particularly sensitive to oil contamination and would probably be among the first of the benthic organisms to be impacted by an oil spill. This reaction of a benthic community may reflect prolonged chronic oil contact, and may not be the same if it were hit suddenly by a large oil spill.

Impacts from oil spills on the subtidal hard bottom communities will generally be short term and not significant. Although these impacts may be low, the destruction of unusually sensitive species, particularly microcrustaceans, or species endemic to the area is possible, although the likelihood is probably low. A more serious impact may occur if a species that has an important community function is destroyed on a particular reef or hard bottom area from an oil spill. The community may be significantly altered until the population of the impacted species is replaced by brood stock from other areas. Until ecological relationships on subtidal hard bottom communities are better understood, the likelihood of such an impact is unknown.

Impacts to the benthic community could be increased if more than one oil spill hit the same area before the benthic community had time to recover from a previous oil spill. Two spills over 1,000 barrels are expected for the proposal.

Little evidence exists that kelp is harmed by oil. Under extremely heavy repeated oilings, the reproductive biology of kelp may be interfered with, but this is speculative. The impact will be the mortality of the many canopy associates which range from invertebrates through fish. Particularly susceptible are probably the microcrustacea, especially mysids. Because of rapid reproductive rates and short life cycle, (North, 1971) the population of most of these associates should return to prespill levels within a year.

The benthic areas in Southern California that would be sensitive to normal oil production activities are: 1) the "purple coral" Allopora californica areas Tanner Bank, Cortes Bank, Osborne Bank and Seventeen Fathom Bank, 2) hard bottoms near the Channel Islands National marine sanctuary, 3) the known fossil limpet Vema hyalina area on the Santa Rosa-Cortes Ridge, 4) several scattered hard bottom areas in the Santa Maria Basin and the Southern California Bight.

The impacts caused by the 207 exploratory wells and 475 development/production wells on 10 platforms would be very low and very high in the immediate svicinity of the production platforms. The life expectancy of production platforms is 25 years and the combined drilling and platform impacts mentioned above should last at least for the duration of the platform. The expected number of oil spills due to the proposal is two. The probability of a large 1,000 bbl or greater spill occurring 75 percent. Should a large oil spill occur and contact a benthic community, the impacts would be low.

CONCLUSION: Overall impacts to subtidal benthic assemblages will be low regionally. However, subtidal benthic areas will sustain very high local impacts immediately around each of the 10 production platforms predicted for the planning area. Impacts from most of 207 exploratory wells will be very low.

CUMULATIVE IMPACTS: Impacts from 56 platforms rather than 10 will in most areas of southern California remain very high immediately around the platforms and the impacts to the wider area will be very low. An exception to this may be the Santa Barbara Channel where in certain areas of platform concentrations, effects may accumulate and extend past the 100 or 1000 meters summarized above. The total number of large 1,000 bbl or greater spills form all future, past and present oil activities is 13 (12.16) with a 99 percent probability of one or more large spills occurring.

CONCLUSION: Very high impacts will occur immediately around 56 platforms rather than 10. Overall, oil spill related impacts would remain low.

(c) Impacts on Fish Resources

Implementation of the proposed action, which includes two base sales in the southern California planning area, would generate activities which have the potential to impact fish resources. In this analysis it is assumed that the two lease sales occur, that 207 exploration wells are drilled and result in discoveries of 462 million barrels of oil and 726 billion cubic feet of natural gas. Production of these conditional oil and gas resources would require the drilling of 475 development and production wells which would be done from 10 production platforms. Transportation of the oil and gas resources to shore would require four oil pipelines, five gas pipelines and use of tankers and barges. Production and transportation of the oil resources generation oil spill risks with 1.39 spills being the estimated number of oil spills greater than 1,000 barrels. This analysis assumes two oil spills greater than 1,000 barrels occur; that 207 exploration well are drilled; that 475 production and development wells are drilled from 10 new platforms and that nine pipelines are run to shore. These potential impact generating factors are assumed to take place over approximately 30 years.

Drilling of the 207 explorations and 475 production wells would result in the discharge of approximately 3,070,000 barrels of drilling muds and cuttings. At each discharge location a plume of discharged muds and cuttings, suspended in the water column and settling to the bottom, may reduce the use of these areas during the short period (several weeks to several months) of discharges. The potential impact from these discharges in the water columns are expected to be largely sublethal or very low. As the discharged muds and cuttings settle to the bottom they typically cover the bottom in a cylinderically shaped area which is usually limited to several areas in size. Benthic organisms are frequently smothered in these areas which would result in loss of food organisms for bottom feeding fish species. These benthic population recover in several years. Given the very small areas that would be impacted the expected impacts on all fish species are expected to be by in large sublethal even the local areas. Thus very low impacts to the fish resources of the planning area are expected from the discharge of the estimated 3,070,000 barrels of drilling muds and cuttings. However, in the areas around the 10 production platforms the discharges of drilling muds and cuttings will be far more concentrated and local impacts in the areas around platforms may generate some mortality to ground fish, benthic crustaceans and molluses which are most susceptible to these impacts. Therefore until areas adjacent to the 10 production platforms the local impact to fish resources is expected to be low.

Placement of 10 production platforms may generate far more significant effects on fish resources because production platforms become artificial reefs. Organisms which require a hard substrate attach to the submerged portions of the platforms. Fish species which require shelter congregate under and around the platform as well as fish species which feed on the attracted organisms. Studies in southern California have measured the increased biomass associated with the artifical reef effects of offshore platforms and concluded that there are significant increases in fish biomass when compared with nears, soft and hard bottom areas. However, many questions regarding artifical reefs in the offshore marine environment are still being addressed by ongoing studies. Thus, this analysis does not conclude positive artifical effects eventhough they have been demonstrated in many areas.

The nine pipelines to shore assumed in this analysis have the potential to generate localized impact. Trenching for, and laying of pipelines disrupts bottom sediments which may smother fish or food organisms when it resettles. Such impacts are both short term and local (approximately 100 meters wide along the pipeline route) and they constitute a low impact in the local area disrupted by pipeline installation.

The two oil spills greater than 1,000 barrels assumed in this analysis have the potential for generating adverse impacts on a variety of fish resources.

Spilled oil promtly rises to the surface of the water where it spreads out and weathers. Thus, most oil spill effects are expected in the surface layers of the water column and along the shareline and these areas of most sever potential impacts are the focus of this analysis. There fish species which spend significant part of their life cycle in the surface of the water column or are dependent on coastal areas are most susceptible in oil spill impacts.

In the southern California planning area, northern anchovies, and squid are the most vulnerable species to oil spill because they are the principal species that concentrate in the surface layer on shallow nearshore areas. Although many other species have at least one life stage that inhabits the surface layers on shallow nearshore areas. They are not expected to be significantly impacted by the two oil spill assumed in this analysis because their egg, larval, juvenile and adult stages are so widely distributed in space on time that it is unlikely spilled oil would contact a significant part of their population. Thus, for all fish resources, except anchovies and squid, the expected impact are low and limited to local areas.

Dense schools of anchovies of up to several hundred tons are found during daylight hours in April-June at the surface within 230 miles of the coast. A large oil spill contacting one or more of these schools could kill enough individuals to cause a small reduction in the population of the planning area. Since mother anchovies are abundant along much of the west coast and reach sexual maturity rapidly, recovery is expected to be rapid, taking one to two years. Thus, for mother anchovies the expected impact is low in the entire planning area.

The same low planning area wide impact is expected for squid. The mechanism of impact is slightly different. Squid form large schools in surface nearshore waters for breeding and an oil spill could kill enough individuals to cause a small reduction in the planning area population. Recovery would take only one to two years because squids are abundant wide spread and reach sexual maturity rapidly.

CONCLUSION: Fish resources of the southern California planning area are expected to be limited to low and local impacts for all species except northern anchovies and squid. For northern anchovies and squid the expected impact are low for the entire planning area.

CUMULATIVE IMPACTS: This analysis assumes a total of 688 exploration wells, 2520 development and production wells and 56 production platforms. The impact of these assumed levels of activities are expected to be low and limited to the local areas around exploration wells and production platforms. The expected number of oil spills from all sources in the southern California planning area is 12.16 spills greater than 1,000 barrels, when 13 oil spills are assumed in the analysis the expected impact go beyond local area effects for more species than northern anchovies and squid. Low planning area wide impact are expected for dangerous crabs, flatfish, and salmon. The expected impacts on northern anchovies and squid remains at the low level. However, the local area impact for salmon may reach a high level with moderate local impact expected for salmon.

CONCLUSION: Planning area wide impacts to fish resources are expected to be low for northern anchovies, squid, dangerous crab, flatfish and salmon. Local area impact on salmon are expected to be moderate.

(d) Impacts to Marine Mammals

Marine mammals breeding or migrating through the Southern California waters will experience the same types of impacts as discussed for Oregon/Washington. Over the life of the proposal, production of the expected 462 million barrels of oil is expected to require the installation of ten platforms. Noise and disturbance from seismic activities, air and vessel traffic and normal platform activities may disrupt normal behavior in some marine mammals. Possible noise avoidance behavior has been demonstrated by the gray whale and may occur in other cetaceans. Other cetaceans use sound for echo location, communication and possible stunning or killing of prey species. Large numbers of platforms, as predicted for the Santa Barbara Channel, may force cetaceans to use migratory routes with less favorable food resources. The waters of the SCB are also important because they are part of the coastal migration route of much of the world's entire California gray whale population and the offshore routes of the North Pacific stocks of the blue, humpback, and fin whales. There could be a moderate ecological impact to endangered whales and a low to moderate ecological impact to other cetaceans due primarily to the longevity of the impact.

Noise can also temporarily frighten seals and sea lions from rookeries causing infant mortality. Five pinniped species breed and rear their young on the Northern Channel Islands, producing about 20,000 young each year. Forty percent of the world's population of California sea lions and northern elephant seals breed on the Channel Islands. The potential for a high impact exists. However, necessary periods of high noise level should be relatively short and infrequent. The largest breeding areas are located withing the Channel Islands Marine Sanctuary which provide a minimum of six miles from oil and gas activities. Other smaller breeding areas which occur on the mainland near Point Arguello and Point Conception are more vulnerable. However, it is unlikely that any vessel or air corridors or supply bases will be located near pinniped rookeries in this Planning Area.

Accidental events could cause low to very high impacts to marine mammals. Over the life of the proposal, two spills of 1,000 barrels or more are expected to occur. The probability of one or more spills occurring is 75 percent. Chances of at least one spill occurring at some time during the proposal and hitting part of the Channel Islands or areas of cetacean migration are high. Chances of a spill hitting any one particular area in the Channel are low. A spill in the vicinity of seasonally reproducing pinnipeds could have moderate impacts due to feeding disruption, eye and skin irritation and human intrusion during cleanup. Northern fur seals breed on the Northern Channel Islands and are particularly sensitive to oil contact, losing sufficient heat and buoyancy to result in death. Guadalupe fur seals are also highly sensitive to oiling but occur in very low numbers and do not breed in southern California. The impact to these animals could be locally high. With the exception of the fur seals and breeding animals, there are no known serious impacts to pinnipeds from oil.

Multiple spills in the same area during the life of the proposal could elevate significant impacts at least one level (example: from moderate to high) due to the inability of a population to recover before a second event. However, chances of two spills contacting the same area twice is very low.

CONCLUSION: Overall impacts to marine mammals from normal activities as the result of the proposal are likely to be low except for whales which are likely to sustain moderate ecological losses.

Locally high impacts to northern fur sales are expected.

CUMULATIVE IMPACTS: In the unlikely event that all resources of the Southern California Planning Area are leased and developed over the life of this proposal, the cumulative impact of OCS activities on marine mammals would probably have low to moderate levels of impact similar to, but greater than what is projected for the proposal. Total resource development assumes that 27 platforms are required to develop the resources. There are presently 29 platforms in southern California. Since normal activities such as noise from seismic vessels and platform operations are potential locally significant impacting sourcess, the proposal substantially increases cumulative impacts to cetaceans. Cumulative impacts are expected to be moderate to cetaceans, that is, some individuals may undergo long-term behavior changes but species are expected to maintain a viable populations. Potential impacts to other marine mammals from normal oil and gas activities associated with an estimated 56 platforms would probably increase slightly but remain low.

The expected number of oil spills greater than 1,000 barrels is four with the total resource scenario. The probablity of one or more spills is 97%. The increment of risk contributed by the proposal is considered moderate when compared to the cumulative estimate for 13 spills from all sources in this Planning Area. Considering all sources, the cumulative probability of one or more spills occurring from an estimated 56 platforms is very high, 99+%. Projected new leasing activities by the State of California nearshore of these platforms will further intensify oil and gas operations in southern California. Marine mammals migrating close to shore are more likely to be disturbed by emplacement of these platforms. Also, the risk of a spill contacting a mainland breeding area is much greater due to the proximity of the coastline and reduced time for oil spill containment efforts. Multiple spills in the same area during the life of the proposal could elevate significant impacts at least one level due to the inability of a population to recover before a second event. The chances of two spills contacting the same area twice is very low.

With or without the proposal, most marine mammals are expected to suffer moderate impacts over the life of the proposal. Northern fur seals may suffer high impacts. Changes in area usage by cetaceans are possible in order to avoid increasing human activities. Migrating species are subjected to stresses from anthropogenic sources throughout their range. Ocean waters off southern California are not pristine. Discharges from 56 platforms will contribute to degradation of marine water quality already stressed by municipal and industrial discharges, commercial shipping and natural oil seeps.

CONCLUSION: The cumulative impacts from the proposed OCS lease sales in the Southern California Planning Area combined with existing OCS and non-OCS activities within the range of migrating marine mammals will have moderate impacts on most species.

(e) Impacts to Coastal and Marine Birds

Discussion: Coastal and marine birds nesting or migrating through the Southern California Planning Area will be susceptible to the same impacts as those described for Oregon/Washington. Normal activities are expected to have low impacts to avian species, however, the potential exists for locally high impacts if activities occur near nesting areas. Noises and disturbances from vessel and air traffic are potentially the most threatening impact source to these birds. The most important nesting areas within the Planning Area are located in the Channel Islands and in small coastal estuaries on the mainland. Nesting species which are most sensitive include Xantus' murrelet, Cassin's Auklet, and Western Gulls. Endangered birds including Brown pelicans, California Clapper Rails and least terns are discussed in the following section (e). Due to the status of the Channel Islands as a Marine Sanctuary it is unlikely that any noise or disturbances from normal activities will occur near enough to affect these island colonies. High impacts to most nesting birds are therefore considered unlikely from normal activities. The effect of platform discharges on avian species is uncertain.

Over the life of the proposal, production of the estimated 462 million barrels of oil are expected to result in two spills greater than 1,000 barrels. The probability of one or more spills occuring is 75%. If a spill were to contact a seabird rookery during the breeding season, the nesting success of 11 species could be highly impacted. Chances of at least one spill contacting part of the Channel Islands or nearby areas are high. The extent and severity of impacts to seabirds will depend on the species, season, area, size of spill and success of containment efforts. Moderate to high impacts to some species are expected. The Channel Islands contain the only U.S. nesting sites for the Brown pelican and black storm-petrel. The world's largest Xantus' murrelet colony occurs on Santa Barbara Island. Impacts of high regional significance are possible to these species. Nesting birds at risk also include Cassin's auklet (San Miguel Island), western gull, ashy storm-petrel and Brandt's cormorant. While some species may suffer high impacts, others may experience low impacts. Different species migrate and nest at different times and spend more or less time on the water. Not all species are likely to be affected by an oil spill.

Spills in other areas of Southern California waters would have low to moderate impacts. The majority of the birds are migrants rather than resident nesters. Migrant birds are much less concentrated but occur during the winter season when temperatures are lower, oil spills remain longer and storms are more frequent. Resultant deaths are therefore often high though the impact to the entire species may vary.

Multiple spills in the same area during the life of the proposal could elevate significant impacts at least one level (example: from moderate to high) due to the inability of a population to recover before a second event. However, chances of two spills occurring in an area due to the proposal are very low.

CONCLUSION: Overall, normal activities are expected to have low impacts to marine and coastal birds in this Planning Area. Accidental oil spills could result in regionally moderate and locally high impacts to nesting species and regionally low to locally moderate impacts to migrating species. Regionally high impacts are considered possible to, black storm-petrels and Xantus' murrlet.

CUMULATIVE IMPACTS: In the unlikely event that all resources of the Southern California Planning Area are leased and developed over the life of the proposal the cumulative effect of OCS development activities on marine and coastal birds would probably have low to moderate levels of impact similar to but greater than what is projected for the proposal. Total resource development assumes that 29 platforms are required to develop the resources. Potential impacts from normal activities to marine and coastal birds would probably increase but remain very low. Platform discharges are not expected to have effects on marine and coastal birds although prey species of some birds may be affected (see Fishes, Plankton). Overall, impacts are expected to remain very low from normal activities.

The expected number of oil spills greater than 1,000 barrels is four assuming total resource development. The corresponding probabilty one or more spills occurring is 97%. This increment of risk contributed by the proposal is considered moderate in terms of the cumulative risk for 13 oil spills from all sources in the Planning Area. The probability of one or more spills occuring is 99+%. Marine and coastal birds could experience locally high impacts if contacted with oil. The risk of a spill contacting part of the Channel Islands is probably high. Multiple spills in the same area during the life of the proposal could elevate significant impacts at least one level due to the inability of a population to rocover before a second event. The chances of two spill contacting the same area twice are very low.

With or without the proposal, some coastal and marine birds are expected to suffer low to moderate impacts during the life of the proposal. Seabird breeding success is sensitive to environmental factors affecting their prey. The northern anchovy is important prey for many breeding birds. Recent fluctuations in anchovy abundance, location, and schooling depths have affected breeding colonies on Santa Barbara and Anacapa Islands. Commercial fishing of the anchovy is also a source of potential adverse impacts. Migrating species are subjected to stresses from anthropogenic sources throughout the Pacific coast. Brown pelicans and cormorants suffer severe breeding losses as the result of DDT discharged from municipal and industrial outfalls in southern California. Loss of habitat and human disturbance have been and will probably continue to be the most serious impacts to avian fauna. Most important breeding colonies in southern California occur within the Channel Islands Marine Sanctuary boundaries, and are protected from disturbances. Overall, impacts are expected to be regionally low to moderate and most species are expected to maintain viable populations.

CONCLUSION: The cumulative impacts from the proposal in the Southern California Planning Area, combined with other OCS and non-OCS activities within the range of migrating birds will have regionally moderate impacts to coastal and marine species.

(f) Impacts to Threatened and Endangered Species

Threatened and endangered species breeding or migrating through the Southern California Planning Area will be susceptible to two major groups of agents which can cause impacts -- normal activities and accidents.

Noise and disturbance due to the operation of seismic survey vessels, crew and support boats, drillships and helecoptor overflights are likely to occur as a result of the proposal. These are the so called normal activities. This analysis assumes tht the proposal would result in 207 exploration wells, 475 production and development wells and 10 new platforms and nine pipelines to shore. The expected impacts from these activities are discussed by species.

The potentially most determental impact to most threatened and endangered species would occur if contact was made with an accidential oil spill. This analysis assumes that two oil spills greater than 1,000 barrels occur. The expected impacts of two oil spills are described species by species. A formal Section 7 Endangered Species Consultation by MMS with NMFS and the FWS was conducted for the proposed southern California Lease offering, April 1984. The biological opinion from FWS was dated September 30, 1983 and covered the southern sea otter, California brown pelican, bald eagle camerican peregrime/alcon, light-footed clapper rail, California least term and salt marsh birds-beak. The biological opinion from NMFS was dated October 4, 1983 and covered the gray whale, right whale, blue whale, fin whale, sei whale, humpback, whale, sperm whale, green sea turtle, leatherback sea turtle, Pacific Ridley sea turtle, and loggerhead sea turtle.

See Chapter V for a description of the consultation process for Section 7 of the Endangered Species Act of 1973. The MMS prepared a request for information concerning the proposed 5-Year OCS oil and gas lease sale program. A response from NMFS dated October 29, 1985 is included in Chapter V. Specific impacts to species in Southern California are discussed below:

Brown Pelican: Normal activities are not likely to impact the brown pelican. Noise and disturbance could have high impacts if nesting birds were disturbed but this is considered unlikely. All U.S. brown pelican rookeries are located within the Channel Island Marine Sanctuary which prohibits oil and gas activities within its boundaries. The estimated 10 platforms from this proposal, and associated support operations would occur a minimum of six miles from nesting areas. Foraging pelicans could be disturbed by vessel traffic while feeding on adjacent waters. These interruptions are considered very low impacts. Adverse impacts from the discharges of ten platforms to northern anchovies could indirectly impact the pelican if the availability of these fishes as prey were affected.

Accidental oil spills could have moderate impacts of regional significance to this species. The probability of one or more spills occurring is 75%. Two oil spills are expected to occur from this proposal. Since pelicans forage widely over the southern California area it is likely that individual birds may perish from oiling. Locally high impacts are possible. Although oil spill containment efforts and possibly dispersants would be employed to protect breeding colonies of the brown pelican, contact could occur. Since breeding locations are limited to a few sites (primarily Anacapa Island, and more recently Santa Barbara Island), and birds are heavily concentrated in and around these locations, moderate impacts of regional significance could occur.

Southern Sea Otter: The southern range of this species occurs within the northern limit of this Planning Area. Normal activities are not expected to impact the sea otter because they will not occur in sea otter habitat areas. Accidental events could cause locally high impacts. Two spills of over 1,000 barrels are expected to result from this proposal. The probability of one of more spills occurring is 0.75. Loss of individual otters wandering south of the range would have locally high but regionally low significance. Assuming oil spill containment and possibly dispersant methods were ineffective, it is possible that a spill could hit a sea otter colony resulting in deaths to many animals. If breeding animals perished, locally high to very high impacts could occur. Depending upon the number of otters impacted, condition of oil, and numerous other factors, their mortality would attain regional significance. However, it is unlikely that impacts from a single spill would exceed moderate at the population level.

Multiple spills in the same area during the life of the proposal could elevate significant impacts at least one level due to the inability of a population to recover before a second event. Repeated losses of individuals could approach regional significance.

Peregrine Falcon: Normal activities are not likely to impact this species. Peregrines have been observed nesting in close proximity to human activities in the Southern California Area. New construction of onshore support facilities could impact nesting success if explosives or heavy equipment were employed nearby when birds were in a critical stage of their nesting activities. Careful planning should insure that impacts do not exceed regional low significance. Accidental oil spills could cause loss of feeding habitat and contamination of peregrine prey species. Peregrines could become ill and be oiled from consuming oiled prey. Loss of a breeding pair of peregrines could have regionally high impacts to the California population. The probablity of one or more spills occurring is 75%. Due to the low numbers of peregrines in the area, and their preference for terrestial prey, it is considered unlikely that peregrines will be oiled and sustain impacts exceeding low significance from this proposal.

Bald Eagle: Normal activities are not likely to impact this species. Bald Eagles have recently been introduced to Santa Catalina Island, but also occur on the mainland. An accidental oil spill could contaminate prey of bald eagles foraging over mainland or Catalina beaches. If a beached oiled bird is consumed by a bald eagle, illness or death could occur. Impacts to the small Catalina population would be locally very high. The chances of this occurring are considered possible but unlikely due to bald eagle feeding habits (primarily terrestial prey) and the small number of birds expected to occur near California beaches.

Gray whale: Normal activities are likely to cause low to moderate impacts to gray whales due to noise associated with seismic and platform operations. Impacts are the same as discussed for Oregon/Washington. Potential disturbances from noise from the 10 platforms expected and associated vessel traffic are considered to have low impacts to gray whales. Accidental oil spills could have low to moderate impacts if large numbers of whales were contacted with oil. The probablity of one or more spills occurring is 75%. While it is possible a spill could occur while large numbers of whales are present, it is unlikely that this species would suffer impacts exceeding low to moderate regional significance.

Guadalupe fur seal: Normal activities resulting from the proposal should not adversely affect this species. The Guadalupe fur seal is a rare visitor to Southern California. Since 1968, a few juveniles and an occasional adult have been observed to haul out each year during the summer months on San Miguel Island (NMFS, 1985). An accidental oil spill could have locally very high impacts to those individuals present. Potential impacts to fur seals have been discussed earlier. Loss of the few individuals present in this Planning Area would probably not exceed regionally low significance.

California least tern: Normal activities are not expected to impact this species. California least terns breed on beaches, in small coastal lagoons and forage over southern California coastal waters. New construction of onshore facilities could result in loss of important habitat or disturbance to nesting birds if located nearby. Carefull planning should prevent adverse impacts. Accidental oil spills could impact least terns during foraging activities offshore or if oil entered an estuary where they feed. Terns dive for food and are therefore vulnerable to oiling. Since least terns forage widely over the Planning Area, and two spills are expected from the proposal, it is possible that individual terns could become oiled. Small breeding colonies of terns would be the most severly impacted. Since breeding colonies are widely spread in their locations impacts are not expected to exceed regionally moderate significance.

Light-footed Clapper Rail: Normal activities are not expected to impact this species. Southern California clapper rail populations are small and located primarily in the southernmost portion of the Planning Area. An accidental oil spill could cause local to regional very high impacts to this species if oil entered an estuary where they occur. Chances of more than one colony being impacted are very low. Oil spill containment efforts should be effective in protecting the small estuaries where rails occur.

Salt-marsh bird's beak: This species is not expected to be affected by the proposal.

CONCLUSION: Normal activities are expected to have very low impacts for most threatened and endangered species in the Southern California Planning Area. Low impacts could occur to cetaceans due to noise and disturbances. Accidental events could cause locally high impacts to some species, and regionally moderate impacts to California brown pelicans, and California Clapper Rails. Impacts to the southern sea otter from accidental oil spills are unlikely to exceed moderate at the population level.

CUMULATIVE IMPACTS: In the unlikely event that all resources of the Southern California Planning Area are leased and developed over the life of the proposal the cumulative effect of OCS development activities on threatened and endangered species could probably have low to moderate levels of impact similar to but greater than what is projected for the proposal. Total resource development assumes that 56 platfroms are required to develop the resources. Potential impacts from normal activities to most species would probably increase but remain very low. California gray whales are expected to experience moderate impacts from increased noise and disturbances. Platform discharges from the 56 platforms expected are not expected to have effects on most species although prey species of brown pelicans may be affected. Overall, impacts are expected to be low from normal activities.

The expected number of oil spills greater than 1,000 barrels is assumed to be two under the proposal. Thus, the increment of risk contributed by the proposal is considered moderate in terms of the cumulative risk for 13 oil spills from all sources in the Planning Area. The probablility of one or more spills occurring is 99+%. Threatened and endangered species could experience locally high impacts if contacted with oil. The risk of a spill contacting part of the Channel Islands is probably high. The brown pelican is likely to suffer some

losses. Locally high impacts could occur to this species. Multiple spills in the same area during the life of the proposal could elevate significant impacts at least one level due to the inability of a population to recover before a second event. The chances of two spills contacting the same area twice are very low.

With or without the proposal, threatened and endangered species are expected to suffer low to moderate impacts during the life of the proposal. Brown pelican breeding success is sensitive to environmental factors affecting their main prey, the northern anchovy. Recent fluctuations in anchovy abundance, location, and schooling depths have affected pelican breeding colonies on Santa Barbara and Anacapa Islands. The sea otter has been stressed by mortalities related to gillnetting. Migrating species are subjected to stresses from anthropogenic sources throughout the Pacific coast. Brown pelicans suffered severe breeding losses as the result of DDT discharged from municipal and industrial outfalls in southern California. Loss of habitat and human disturbance have been and will probably continue to be the most serious impacts to least terns and clapper rails. Overall, impacts are expected to be regionally low to moderate and most species are expected to maintain viable populations.

CONCLUSION: The cumulative impacts from the proposed OCS lease sales in the Southern California Planning Area, combined with other OCS and non-OCS activities within the range of threatened and endangered species will have moderate impacts. The increment of risk of an accidental oil spill from this proposal is considered moderate in terms of existing risks from foreign and domestic tankering.

(g) Impacts on Estuaries and Wetlands

Proposal-related factors potentially affecting wetlands are oil spills (the proposal is expected to result in the production of an estimated 462 million barrels of oil. Two spills greater than 1,000 barrels are assumed to occur as result of the proposal), and possible onshore construction. Two new supply basis and nine pipeline land falls are assumed to occur as a result of this proposal. The activities associated with offshore drilling and platforms are not expected to cause impacts on estuaries and wetlands.

In the event of a large spill, which completely covers the surface and the tidal flats of an estuary, and remains for several days, destruction could be manifested for over 10 years. Some species within the estuary, if endemic, may be permanently eliminated. Artificial restocking of the habitat may also be necessary (See Ch. III.C.4.b.(7) for a list of estuaries of importance). More detailed examinations of the impacts on estuaries and wetlands can be found in BLM (1975, 1979, and 1980 MMS 1983a, 1983b). Further discussion of the impacts of estuaries and wetlands occurs in Section IV.B.9.a.(4)g).

Predicting the recovery period from prolonged oil coverage of an estuary is complicated by how long the oil in the substrate remains toxic, thereby preventing repopulation to commence. Recovery from a severe spill, if most species have been eliminated, could involve a successional sequence where preclimax species occupy a habitat, temporarily outcompeting the climax species. This could cause recovery to take longer than ordinarily would be required.

According to Shenton (1973), recovery of a mud flat would require over 10 years. The important salt marsh would be effectively killed for 6 months to a year from a small coverage, but completely killed for an unknown time (until the sediment becomes nontoxic enough to sustain seed germination and sexual maturation) if the coverage is heavy and lasts several days.

The impacts on plankton will vary from an insignificant interference with ecological relationships lasting less than a year if only a small portion of the water surface were covered for several tide cycles. The larvae of benthic of fish species can be decreased so subsequent years will have small populations of the year-class which was oiled.

Since the openings to estuaries and the protective ability of oil containment-diversion equipment is highly variable, it is necessary to generalize when discussing potential impacts of oil spills on estuarine habitats. With the use of conventional containment-diversion techniques, it is assumed that estuary openings of greater than 100 meters are extremely difficult to protect once oil approaches the mouth. Anaheim Bay, lower Newport Bay, Mission Bay, and San Diego Bay have widths greater than

100 meters. During certain periods of the year (winter) it might be possible for nine additional estuaries to have entrances of greater than 100 meters. The breakwater opening and channel entrance to Anaheim Bay are each less than 200 meters wide and would probably allow additional diversion capabilities (BLM personnel observations). According to Baker (personnel communication) the entrance to Mugu Lagoon very often becomes greatly expanded during wet winter months. A large spill entering an estuary would most probably cause an ecological loss requiring over 10 years for recovery.

The probability of a large 1,000 bbl or greater spill occurring is 75 percent. Should a large oil spill occur and enter an estuary the impact would be very high if the oil covers a significant portion of the estuary and remains for several tidal cycles or low for a spill covering a smaller portion of the estuary or one covering a significant portion of the estuary, but remaining for only a couple of tidal cycles.

CONCLUSION: Estuaries and wetlands will not experience impacts from normal production. Overall a large spill will cause low impacts (for small coverage of the estuary or for signifiant coverage for only a couple of tidal cycles). In the event a spill entered and covered an estuary for several tidal cycles local impacts would be very high.

CUMULATIVE IMPACTS: The total number of large 1,000 bbl or greater spills from all future, past and present oil activities is 13 (12.16) with a 99 percent chance of occurring. The low to very high impacts predicted from a spill and contact are discussed above. If the additional platforms are located directly off estuaries with "wide" 100 meter openings, a spill that would flow directly to any of the estuaries directly onshore from a platform would be difficult to contain or divert before entering the estuary.

CONCLUSION: Overall a large oil spills are expected to cause low impacts. However, if an oil spill enters an estuary and remained in the estuary for several tidal cycles local impacts would be very high.

(h) Impacts to Areas of Special Concern

Areas of special concern include marine life refuges, ecological reserves, areas of biological signifiance (ASBS), underwater parks, and estuaries. They are designed to protect intertidal and shallow water subtidal inhabitants or estuaries (See Ch.III.C.4.b.(8) for a list of these areas).

Because of the high degree of concern placed upon ASBS, the State of California required State regulated industries and cities to discharge wastes only a "significant distance" from these significant biological areas to assure maintenance of natural water quality conditions in these areas. An oil spill occurring in the vicinty of an ASBS and driven by winds and currents into the ASBS proper, would degrade the natural water quality creating a situation the ASBS Act was designed to prevent.

Oil spills would cause impacts on the shallow subtidal and intertidal areas to the extent that is discussed in Section IV.B.9.(4)(b). The impacts from a large spill could be an insignificant interference with ecological relationships lasting less than a year for the shallow subtidal areas and a significant interfernce with ecological relationships lasting for less than 2 years for the intertidal. This conclusion is primarily based upon the large Santa Barbara oil spill (Straughn, 1970; Foster, 1974 and Foster, et al., 1971) where the impact to the intertidal lasted less than two years.

Although most of the areas of special concern involve intertidal or subtidal benthic communities, some of the areas are important bird of pinniped habitats. San Miguel, Santa Rosa, Santa Cruz and San Nicolas Islands are important pinniped areas. The islands listed above and Anacapa and Santa Barbara Islands are important areas for sea birds. Anaheim Bay and Tijuana Estuaries are important bird habitats. See Sections IVB.7,8,9,10,(d)(e)(f) for impacts to pinnipeds and seabirds. Impacts to the special designated areas could also come from pipelines. However, with the high degree of concern placed upon these areas by the State of California, it is highly unlikely that pipelines would be allowed to transverse them. Impacts associated with drilling and platform construction are not expected to occur since the minumum distance of three miles away from these activities would be two far away to cause impacts.

There should be no significant impacts to areas of special concern in southern California from the combined 682 exploratory and development/production wells on 10 platforms from normal operations because of the distance separating the platforms and areas of special concern. The probability of a large 1,000 bbl or greater spill occurring is 75 percent. Should a large oil spill occur and contact an area of special concern, the impacts will vary from low for shallow subtidal and intertidal areas (see Section IV.B.10.a.(4)(b)) and, very high for a massive spill entering and remaining for several tidal cycles for estuaries (see Section IV.B.10.a.(4)(g)). Impacts on marine mammals and birds will range from low (Regionally) to moderate (Locally) (see Sections IV.B.10.(4)(d) and (e) for impact definitions specific to these biological resources.

CONCLUSION: No impacts to areas of special concern are likely from normal oil operations. Overall, impacts from oil spills due to the proposal would be low regionally. Local impacts would be moderate.

CUMULATIVE IMPACTS: The total number of large 1,000 bbl or greater spills from all future, past and present oil activities is 13 (12.16) with a 99 percent probability of one or more large spills occurring.

CONCLUSION: Impacts from large oil spills will remain low regionally. However, local impacts to sensitive covers would be moderate.

(i) Impacts on National Marine Santuaries

The Channel Islands National Marine Sanctuary is located in southern California and could be impacted by the proposal. The most vulnerable resources within the

Sanctuary are seabirds, pinnipeds, intertidal and subtidal benthic organisms. Oil spills and oil spill cleanup efforts may adversely impact seabirds and pinnipeds by disrupting their foraging, breeding, haulout or nesting areas, and by affecting the survival and health of individuals. Additionally, vessel traffic, human intrusion and noise generated during exploration and development may affect seabirds and marine mammals. Potential impacts on marine mammals and seabirds within the marine sancturary are discussed further in Sections IV.B.10.a.(4)(d),(e) and (f).

Oil spills could adversely impact benthic subtidal or intertidal species by affecting their survival, reproduction and repopulation. Platforms and resulting drilling muds and cuttings could affect some subtidal benthic species at the outer limits of the sanctuary if drilling were conducted near the sanctuary border.

Pipelines, which are allowed to pass through the sanctuary, could cause an insigificant interference with ecological relationships lasting less than a year to a signifiant interference with ecological relationships lasting less than two years to subtidal benthic communities. Sections IV.B.10.a.(5)(d) and (e). discuss impacts to recreational boating, fishing, diving, and cultural resources that also could occur within the sanctuary are discussed in Section IV.B.10.a.(5)(f).

CONCLUSION: Impacts to the Channel Islands National Marine Sanctuary are not likely from normal operations. Low impacts could occur locally near the edges of the sanctuary.

CUMULATIVE IMPACTS: The total number of large 1,000 bbl or greater spills from all future, past and present oil activities is 13 (12.16) with a 99 percent probability of one or more large spills occurring. Impacts ranging from low through very high as discussed above for the various biological resources of the Channel Islands National Marine Sanctuary will remain the same but the probability of these impacts occurring will be increased.

CONCLUSION: Overall, impacts to the Channel Islands National Marine Sanctuary are not likely from normal operations. Impacts from large oil spills will remain low.

(5) Socioeconomic Environment

(a) Impacts on Employment and Demographic Conditions

The impact agents which affect demographic and employment conditions are discussed Section IV.B.7.c.(5)(a)

Based on the development time table in Section IV.A.1-1, and the exploration and development assumptions in Section IV.A.2.a.

Increases in population, employment and income as a result of the proposal are to peak in 1995, and permanent changes in population, employment and income are expected to be level from 1999 to the conclusion of production in 2020. Employment is expected to peak at 11,000 jobs and then decline to 800 jobs for the remainder of the project life. Four thousand three hundred thiry two of the peak jobs or 380 of the permanent jobs are expected to be in the oil and gas industry. Population is expected to rise by 6,000 people in the year 1995 and level off at 400 new residents for the remainder of the project life. Personal income as a result of the proposal is expected to peak at approximately $146 million and to level off in 1990 at $10.3 million.

CONCLUSION: The peak impacts from the proposal are an increase of 0.2 percent in employment, of less than 0.06 percent in personal income, and 0.05 percent in population. The overall impacts as a result of the proposal are considered to be low, however, some localized impacts could be higher if all the impacts were concentrated in any one location.

CUMULATIVE IMPACTS: Cumulative impacts are expected to result in change in population, employment and income and are expected to peak in the year 2000, and permanent change in population, employment and income are expected to level from 2006 to the conclusion of production in 2031.

Employment as a result of Federal OCS development could result in the increase in jobs by 85,000, and approximately 25,000 new residents to the study area and result in an increase of approximately $1.4 billion in total earnings.

CONCLUSION: The peak impacts from the proposal are an increase of 2.6 percent in employment, 1.0 percent in personal income, and 1.4 percent in population. The overall impacts as a result of the proposal are considered to be low, however, some localized impacts could be higher if all the impacts were concentrated in any one location, or portion of the entire planning area.

(b) Impacts on Coastal Land Uses and Water Service

(i) Land Use

Of the four Pacific OCS planning units, only the Southern California planning unit has existing oil and gas production. Because of this production, both onshore and offshore, the region possess an integrated infrastructure for the processing and transportation of hydrocarbon products.

Under the proposed action ten hypothetical platforms are anticipated. To service these platforms the following types of facilities would be needed: supply bases, onshore pipelines, and onshore gas processing facilities. Additional refineries or fabrication yards would not be needed as existing facilites are thought to be adequate.

Land use impacts are expected to be quite complex. Because of continued population growth, there is increasing competition for the limited coastal land available. In general, it can be stated that areas with current industrial permitted uses would be available for the construction of onshore facilities in support of offshore oil and gas development. Areas not currently supporting industrial activities or not currently zoned for such uses would not be available as most coastal communities have established policies seeking to preserve tourism, commercial fishing, and agriculture as components of their economic base, and for esthetic purposes. It is also the policy of the State of California that coastal dependent industries be located only in areas allocated to such uses, thereby limiting the construction of new facilities in previously undeveloped areas.

During the exploratory phase, temporary support bases (5-10 acres each) would be needed. Due to the temporary nature of the exploratory phase, and the availability of existing ports, land use impacts are expected to be very low region wide. Land use impacts may occur if existing harbors need to be expanded to accommodate a tempory support base. Because of the competition for space in many of the smaller harbors, the possibility exists that this activity may displace some users if a harbor can not be expanded.

The construction phase will have variable land use impacts depending principally on the size of the community, and the availability of existing onshore oil and gas infrastructure. Smaller coastal communities that are not tied into the existing oil and gas system infrastructure will need to devote land use to supporting pipelines (right of way 50-100 feet wide), pipeline installation and service base (5 acres), pumping stations (40 acres each), and gas processing and treatment plant (50-75 acres). Induced impacts would include the need to construct additional housing, schools, water lines, sewer line, and other community services to support the increased population base. Because of the need for additional construction and problems concerning the availability of land, Land Use impacts are expected to be very high.

The construction phase will have a very low impact on the larger communities. The larger communities, especially the Los Angeles urban area, will only be minimally impacted as they, tend to support a large industrial base, and to be already tied into the existing oil and gas system infrastructure. Induced land use impacts are not expected to be significant either. Large urban centers such as the Los Angeles urban area, tend to have a large housing stock, and adequate community services. There may be an increased demand or commercial space as companies providing services and supplies to the oil and gas industry move in to be near their customer base.

The production and decommissioning phases will have a very low impact on land use. In smaller communities the production and decommissioning may each result in a loss of population and resultant slow down in economic activity. This would have the effect of making developed industrial, commercial, and residential land available for other uses. In larger communities the pattern will remain the same as in the smaller communities, however, it will not be as noticeable as changes in oil and gas activity will not be as significant as in the smaller community.

Land use impacts will be very high in small communities seeking to preserve tourism, fishing, and agriculture as their economic base. Land use impacts will be very low in larger communities that have available industrial land, adequate harbor facilities, and which are already tied into the existing oil and gas infra-structure system.

CONCLUSION: Overall, land use impacts will be very low. However, on a local basis, in communities seeking to preserve this economic base, impacts will be very high.

CUMULATIVE IMPACTS: The continued growth of offshore oil and gas activities will tend to lengthen land use impacts of exploration and construction. If proposed onshore facilities are adequate for projected production, additional land use impacts are expected to be very low. Induced impacts may become significant, especially for the smaller communites. In the larger communities the trend toward companies servicing the oil and gas industry moving into the region may accelerate. Decommissioning will continue to affect land use by making the land previously used to support oil and gas activities available for other uses.

CONCLUSION: Overall land use impacts will be very low. However, on a local basis impacts could be very high. Once production is stable or declining, the need for additional onshore facilities is virtually eliminated.

(ii) Water Services

The impact of offshore oil and gas activities on water services are anticipated to be dependent principally on the size of the affected community. In developed urban areas, especially the larger urban communities such as Los Angeles, and San Diego, water services are not expected to be affected and impacts are expected to be very low. In the smaller coastal communities and outlying rural areas, water services would be affected. Water services in the smaller communites are currently stressed and growth control plans have been instituted in some communities in an attempt to match need to the capacity of existing fresh water and waste water treatment system, therefore, impacts are expected to be high.

In the smaller communities and outlying rural areas the establishment of onshore facilities to support offshore oil and gas development will increase the competition for water services. The availability of fresh water will tends to be a limiting factor for determining if a communtiy can absorb additonal population and economic activity. Potential impacts resulting from shortages in fresh water supplies would include: rationing, building moratoriums, the displacement of some industry and commercial activities, overdrafting ground water supplies, saltwater intrusion, and/or the need of some users to supply their own water. The availability of and access to waste water treatment facilities is not as critical as access to fresh water. If waste water treatment facilities are stressed building moratoriums may be instituted until additional capacity is constructed. Periods of peak flow can also result in the excess waste water being passed untreated through the system and dumped into the ocean. This can result in the degradation of water quality around the sewer outfalls. A chronic problem exists in that the waste water treatment facilities in Tiajuana, Mexico are unable to process all its waste water which is resulting in water quality problems around Imperial Beach.

CONCLUSION: Onshore oil and gas development resulting from offshore oil and gas activities will have a very low imapct on water services for large urban centers. The availability of and capacity of water services for the smaller communities is a limiting factor affecting community growth. Onshore oil and gas development will have a high impact or water services for small coastal communities and rural areas.

CUMULATIVE IMPACTS: Water services in the larger urban centers are not anticipated to be affected by continued offhsore oil and gas activity. Continued oil and gas activity in the smaller communities may require that users provide their own water or that these communities tie into water systems that can provide them with additional supplies. Otherwise these communities will need to restrict growth and/or institute rationing programs, or meeting water need through over-drafting. Waste water treatment facilities as they approach capacity will tend to result in growth managemnt plans being placed into effect and the discharge of some untreated sewage into the oce@ environment until an expanded or new facility can be constructed. Continued onshore oil and gas development will have high impacts on water service.

CONCLUSION: Continuous onshore oil and gas development resulting from offshore oil and gas activites will have a low impact on water services for large urban centers. The availability and capacity of water service for the smaller communities is a limiting factor affecting community growth, onshore facilities in support of offshore oil and gas development would have a high impact.

(c) Impacts on Commercial Fisheries

(i) Commercial Fisheries

General impacts of OCS related activities on commercial fisheries are discussed for the Washington/Oregon planning area. More specific concerns for southern California are discussed below.

The amount of on-going vessel traffic interference as a result of crew boats, supply boats, and seismic vessels is of great concern to local fishermen. The current impact level is low. Under the proposal it could increase to moderate. The same is true of gear damage.

Indirect impacts (as a result of impacts to target species) are very low and are expected to remain that way. A possible exception is the hook and line fishery for rockfish, which could incur a low level of losses if seismic exploration alters feeding behavior, and hence catchability.

CONCLUSION: The southern California marine commercial fishing industry will suffer a low level of loss as a result of implementing the proposal.

CUMULATIVE IMPACTS: Long term OCS development in southern California may locally and temporarily elevate negative impacts to comercial fisheries. However, the useful life of platforms, depleted resources, and societal switches to other forms of energy fuels are expected to inhibit a rapid accumulation of OCS activities. Seismic exploration activity related losses may increase for 10 to 20 years, but as reserves are better defined and seismic activity slows in the region, associated losses will also fall.

CONCLUSION: Long term losses to southern California commercial marine fisheries may rise to a moderate level in the next 25 years, but are expected to decrease to a low or very low level at the end of that period.

(ii) Recreational Fisheries

The basic impacts, as discussed for Washington and Oregon in section IV.7.a.(5)(c), remain the same for southern California. The esistence of platforms in this area already provides reef-type habitat. The addition of ten more platforms will increase this habitat, and hence fishing opportunity by one-third. Along these lines, however, there exists the possibility that overfishing of fish concentrations will lead to decreased populations or cychi population fluctuations, causing decreased angler catch or cyclic fluctuations, and instability in the "industry"

CONCLUSION: Impacts to southern California marine recreational fisheries are expected to be nil. However, they could be as much as low, either positive or negative.

CUMULATIVE IMPACTS: Longer time frames and greater development should serve to compound impacts. However, the increase in different impacts could cancel out each other. The activity is liable to expand if platforms, functioning as artificial reefs, contribute significantly to catches. Again the possibility for counter-effects exists.

CONCLUSION: Impacts are expected to be very low, but could be as high as moderate. Net impacts could be positive or negative.

(d) Impacts on Recreation and Tourism

Oil Spills, offshore structures, and pipelines potentially can impact recreational resources. The overall significance of these impacts to recreational resources will depend on the impacting agent, the resource impacted, and the magnitude of the impact to the resource. Each of the impacting agents and their potential impact on recreation and tourism is described within this section.

The number of recreationists and tourists is not static, but tends to increase over time, which in turn increases the value of the recreational resource, thus increasing the significance of any potential impact at the local level. It is important to note that use of recreational areas fluctuate dramatically with weather conditions, population changes, and increases or decreases in discretionary time and money.

It is also important to note that an impact on recreational resources should affect the local economic conditions, and could affect the other recreational resources in the area by both translocation of the recreationists, and by making the resources less desirable. The value of the change in economic conditions (due to potential effects from the proposal) is not constant over the entire coast, but changes depending upon the type and magnitude of the impact, the number of recreationists involved, the time of year of the impact and the duration, and what alternate resources are available. The description of how the impacting agents will generally affect the recreational resources has previously been given in Section IV.B.7.a.(5)(d). Potential impacts as a result of the 5-year program for southern California is described below.

As a result of this proposal it is assumed that two oil spills greater than 1,000 barrels will occur in the southern California planning area.

Based on the fact that containment and diversion of oil spills will commence as soon as a spill occurs, and that the probability of one or more spills occurring is moderate (0.75), it is not expected that a spill will actually occur, reach the shore without containment or diversion, and actually contact a public or private recreation area. Therefore, a low impact is expected to recreational resources. No long term impact is expected to visual resources in the region from oil spills, as cleanup operations will remove the oil, thus returning the area to prespill conditions within a short period of time. The time required for natural cleanup from wave action etc., could vary from a few weeks on exposed coastlines to more than a year for a protected lagoon or wetland.

The impacts to recreational resources caused by offshore platforms are mainly visual and depend upon the distance offshore the platforms are located, and the recreational resources that are on the stretch of coast adjacent to the platform locations. The farther offshore the platforms are located the lower the level of impact that will occur to the onshore recreational resource.

The proposal is also expected to result in the installation of ten platforms and nine pipelines. It is not known where the platforms will be installed, but if they are placed 12 to 15 miles offshore a very low impact is expected to recreation and tourism with a localized low impact to tourism. In addition visual resources will suffer a very low impact over the planning area, and a low impact at the local level. If the platforms are installed at or close to the three mile line the impacts for recreation and tourism at the local level could increase to moderate or high.

The exact levels of impact for recreational resources will depend upon where an indvidual platform is installed, and what the recreational use level of the adjacent onshore recreational areas are, and what the existing visual quality of that particular stretch of coast. This means that a hypothetical platform placed off Santa Monica Bay will have a far higher impact than a similiar platform placed off Point conception, due mainly to the very high level of use of Santa Monica Bay beaches, and the economic value of those recreationists as opposed to Point Conception which has very limited beach use.

The installation of the platforms is expected to result in a low impact over the planning area with localized moderate to high visual impacts.

Pipeline installation can cause a short term disruption of recreational resources at the landfall during installation, but after the installation is complete the only impact will be a localized low visual impact along the onshore right-of-way.

CONCLUSION: As a result of this proposal, the impacts to regional recreational resources are expected to be low with possible local high impacts to visual resources if the platforms are placed close to shore.

CUMULATIVE IMPACTS: Impacts to recreation and tourism, and their allied resources, are expected to occur from other projects described in IV.B.10.a., and which are expected to occur in the region including the expansion at Vandenberg Air Force Base, the expansion of the Ports of Los Angeles and Long Beach, offshore oil and gas activities (Federal and State), population increases, vessel traffic, and increased fishing pressures. The cumulative effect of all of these stresses is expected to have a high impact on recreational resources in the southern California planning area.

As a result of the anticipated cumulative impacts a total of 13 oil spills are assumed to occur in the planning area. There is a 99+ percent probability that one or more oil spills greater than 1,000 barrels will occur.

Based on the fact that containment and diversion of oil spills will commence as soon as a spill occurs, any spill that does occur is not expected to directly contact recreation areas. Therefore, moderate impact is expected to recreational resources.

In addition it is estimated that 17 platforms and 6 pipelines will be installed as a result of future proposals, bringing the totals in the planning area to 56 platforms and 43 pipelines. This will have a moderate impact on recreational resources and possible high impacts as the local level if the platforms are clustered, with corresponding high impacts to the visual resources.

CONCLUSION: The future proposals do not significantly add to the cumulative impacts unless a large oil spill occurs and contacts the shore line, or if the 17 platforms are all located close to the three mile line.

(e) Impacts on Archaeological Resources

Offshore oil and gas operations have the potential to impact cultural resources in southern California as described for Washington and Oregon in section IV.B.7.a.(5)(e).

As a result of the proposal, it is estimated that 10 platforms will be installed in the southern California planning area.

It is not known where the ten platforms or the associated nine pipelines will be installed, or what the extent of bottom disturbing activities will be. However, as surveys are required prior to any bottom disturbing activities, a very low impact to archaeological resources is anticitpated as a result of the proposal.

It is estimated that two (1.39) oil spills greater than 1,000 barrels will occur in the planning area. The probability of an oil spill occurring is 99 percent. As oil spills have a potential to damage archaeological resources by direct oiling, by degrading the viewshed, and by causing inadvertent damage to the resources during clean-up operations, a low impact is expected to archaeological resources as a result of the proposal.

CONCLUSION: Low impacts to cultural resources would be expected from the proposal. These impacts would primarily be a a result of oil spills occuring offshore and directly oiling submerged sites.

CUMULATIVE IMPACTS: Impacts to cultural resources over the region will occur both offshore and onshore as a result of the other projects which are described in IV.B.10.a. This is expected to result in a moderate impact over the planning area.

As a result of all past and future OCS proposals it is estimated that 56 platforms will be installed. These platforms and the associated pipelines are not expected to contact any archaeological resource as surveys are required prior to any bottom disturbing activity to ensure that no archaeological resources are disturbed. Due to the number and the extent of the bottom disturbing activities, a low impact to archaeological resources is anticipated as a result of future proposals.

It is estimated that approximately 13 (12.16) oil spills will occur in the southern California planning area as a result of cumulative sources. There is a 99+ percent probability that one or more oil spills greater than 1,000 barrels will occur in the planning area. As oil spills have a potential to damage archaeological resources by direct oiling, by degrading the viewshed, and by causing inadvertent damage to the resources during clean-up operations, this is expected to have a low impact on archaeological resources.

CONCLUSION: The future proposals do not significantly add to the cumulative impacts, and the impact level is expected to be low.

(f) Impacts on Marine Vessel Traffic

See section IV.B.7.a.(5)(f) for a discussion of generic impacts.

A small increase in marine vessel traffic (i.e. tankers, crew and supply boats, seismic exploration vessels) is expected to occur offshore southern California as a result of this proposal. This small increase in vessel traffic would be due to supporting the level of activity anticipated in this planning area-ten platforms, 207 exploration wells, and 475 development wells.

Any increase in vessel traffic potentially increases the risk of accidents (between vessels or between vessel and platform). These accidents could result in the loss of human life, personal injuries, property damage, and oil spills. Additional conflicts could also arise from increased port congestion and competition for port facilities such as docking berths and pilot boats. These potential problems are expected to be minimal, however, due to the relatively moderate level of activity anticipated in this planning area (10 platforms and accompanying support activities) and the continued enforcement of Coast Guard navigational safety requirements and policy. Coast Guard policy has been to not allow fixed structures in vessel traffic lanes, precautionary areas, or safety fairways, and to not allow a "gated" situation whereby 2 or more platforms are nearby on opposite sides of a vessel lane.

Oil spills, regardless of source (vessel collisions, platform blowouts, pipeline failures, etc.) may impact vessel traffic. Traffic may have to be temporarily rerouted to avoid both direct contact with any spilled oil and to not interfere with cleanup operations. The risk of oil spill occurrence in southern California from the proposal is considered high (68% probability of one or more spills occurring from OCS activities). These impacts to traffic would be only short-term (generally one month or less) and limited to the offshore area contaminated with oil (generally small discontinuous oil patches, area affected depends on the spill size and weather). See section IV.B.8.a.(5)(f) cumulative impact analysis for further discussion on oil spills.

New facilities in the form of supply bases, gas processing facilities, port expansions, and pipelines would be required as a result of this proposal. These facilities would be part of the accompanying support activities (discussed above) for this level of activity.

CONCLUSION: Moderate impacts are expected from the proposal to marine vessel traffic.

CUMULATIVE IMPACTS: Southern California is currently the only area outside of the Gulf of Mexico where there is active oil and gas exploration and development activities. In the unlikely event that all the tracts on the Federal OCS are leased and developed, it is estimated that there would be 56 platforms, 867 exploration wells, and 2,444 development wells. This includes the existing level of activity and the high case for this considered high as the increase in overall marine traffic would be significant. This increase in traffic would increase the risk of vessel conflicts and accidents a significant amount. New facilities would be required and rerouting of traffic patterns may be required.

The risk of oil spills from OCS activities within the southern California planning area is very high (99% probability of one or more spills over 1,000 barrels occurring as a result of the cumulative level of activity). Impacts to vessel traffic from oil spills would be of short-term duration (generally one month or less), and may require additional rerouting of traffic or delays in using port facilities. The ports of Long Beach/Los Angeles and San Diego are major world ports. If a large oil spill occurs in the vicinity of these ports, very high short-term impacts may result, as it may cause port closures, or additional rerouting of vessel lanes temporarily. The major oil spill by the tanker Puerto Rico (35,000 bbls were spilled in November, 1984) in the vicinity of the San Francisco Bay entrance, did not, however, cause significant impacts to marine vessel traffic.

CONCLUSION: High impacts are expected from the cumulative level of development to vessel traffic.

(g) Impact on Military Uses

Most of the southern California OCS is used for various military activities, the exception being most of the Santa Barbara Channel. Offshore oil and gas activities have the potential to impact military activities because of space-use conflicts resulting from additional vessel traffic (above, on, and below the water surface), the placement of permanent and semi-permanent drilling and production structures and activities resulting from them, and activities stemming from cleanup efforts of potential oil spills (See Figure III.C.4.e.(7)).

The current military operations require either "exclusive-use" areas with large safety zones or "joint-use" areas with many precautions and extensive scheduling/ planning efforts for hazardous and critical operations (stipulations). As oil and gas activities are expanded in southern California, additional space-use conflicts are created with the military and other industries as they compete for use of a smaller remaining area.

As a result of this proposal, it is estimated that 10 platforms will be installed in the southern California planning area. If these platforms are located in non-military use areas, a very low impact will result to military use due to the space use conflicts with other industries. If the platforms are located in joint use areas then a high impact will result to military uses, and if any of the platforms are situated in an exclusive use area then a moderate impact would result.

It is estimated that two (1.39) oil spills greater-than 1,000 barrels will occur in the planning area as a result of the proposal. The probability of an oil spill occuring is (0.75). As oil spills have a potential to impact military uses primarily due to the increased traffic associated with clean-up operations, a low impact may result to military activities as a result of clean-up operations.

Consultations will occur between the Departments of the Interior and Defense. The result of the consultation will be a determination as to which tracts are suitable for joint use.

CONCLUSION: Overall impacts to military uses as a result of the proposal are expected to be low, with locally moderate impacts due to the many critical and hazardous military operations conducted off southern California.

CUMULATIVE IMPACTS: The cumulative impacts to military uses are expected to be significant due to the extensive military uses off southern

California. As a result of other projects which are described in IV.B.10.a., and as a result of future OCS proposals it is estimated that there will be a total of 56 platforms, and 12.15 oil spills in the planning area. This number of platforms will cause a moderate impact to military uses in southern California. The probability of one or more spills greater than 1,000 barrels occuring is very high (0.99+). As oil spills have a potential to impact military uses primarily due to the increased traffic associated with clean-up operations, a moderate impact may occur to military activities as a result of cleanup operations.

CONCLUSION: The impact to military uses as a result of all activities is expected to be moderate in the southern California planning area.

(h) Impacts on Native Subsistence

Offshore oil and gas operations have the potential to impact Native subsistence in southern California as is described for Washington and Oregon (see Section IV.B.7.a.(5)(h)).

As a result of this proposal, it is estimated that two (1.39) spills greater than 1,000 barrels will occur in the southern California planning area. The probability of a spill occurring is moderate (0.75). As oil spills have a potential to damage native subsistence resources primarily by direct oiling, and by causing destruction of the intertidal resources during clean-up operations a very low impact is expected to native subsistence over the planning area, with potential localized moderate impacts at any location the spill contacts.

CONCLUSION: The expected impacts to native subsistence as a result of the proposal are very low, with potential localized moderate impacts at any location contacted by an oil spill.

CUMULATIVE IMPACTS: Impacts to native subsistence will occur from offshore and onshore projects, which are described in section IV.B.10.a. and which are anti-cipated to have a moderate impact. It is estimated that approximately 13 (12.16) oil spills will occur in the southern California planning area as a result of cumulative sources. This results in a 99+ percent probability that one or more oil spills equal to or greater than 1,000 barrels will occur in the planning area.

As oil spills have a potential to damage native subsistence resources primarily by direct oiling, and by causing destruction of the intertidal resources during clean-up operations, a low impact is expected to native subsistence over the plannng area, with potential localized moderate impact at any location the spill contacts.

CONCLUSION: The future proposals will not add significantly to the cumulative impacts and the overall expected impact will remain moderate.

(6) Subarea Deferrals

These subareas are proposed to be deferred from leasing in this 5-year program.

(a). Channel Islands National Marine Sanctuary

The Channel Islands National Marine Sanctuary consists of San Miguel, Santa Rosa, Santa Cruz and Anacapa Islands on the outer region of the Santa Barbara Channel and Santa Barbara Island approximately 40 miles south of the mainland coast.

The Channel Islands National Marine Sanctuary, designated on September 22, 1980, includes only the ocean area from the mean high tide line seaward to 6 nm.

The northern Channel Islands are important for numerous reasons. Particularly significant are the marine biological, archaeological, and paleontological resources found on the islands. For example, they contain the largest and most diverse temperate water pinniped (seals and sea lions) community in the world. More than 36,900 pinnipeds, of 6 different species, were counted on the islands themselves, excluding the surrounding waters (Bonnell, et al., 1980). Also, there is evidence of human inhabitants going back to 30,000 years BP, and fossils of the dwarf mammoth (USDI, 1979).

Deferral of the Channel Islands National Marine Sanctuary subarea would significantly reduce the risk of a potential oil spill affecting the Channel Islands National Marine Sanctuary due to the greater amount of time it would take for an oil spill to reach shore. Impacts to sensitive intertidal and subtidal benthic communities, pinnipeds, and seabirds would be reduced. Potential disruption of critical breeding and nesting activities for seabirds and pinnipeds as a result from normal OCS activities would be reduced. The risk of damage from platforms and pipelines, to hardbottom subtidal areas, would be eliminated.

(b). Santa Barbara Channel Ecological Preserve and Buffer Zone

The Santa Barbara Channel Ecological Preserve and Buffer Zone is located south of the city of Santa Barbara. The preserve was established March 21, 1969 by Public Land Order 4587. The Preserve was "withdrawn from all forms of disposition, including mineral leasing, and reserved for use for scientific, recreational, and other similar uses." Tracts adjacent to the Preserve were designated as "adjunct to the Ecological Preserve" and were removed from consideration for leasing by the Order. This Order reflects Department of the Interior past policy regarding OCS leasing in this area. The Ecological Preserve and Buffer Zone consist of 15 full and partial blocks. Leasing in the adjunct to the Santa Barbara Channel Ecological Preserve would require a change in that policy.

The deferral area includes what in the late fifties and early sixties, was a large population of benthic tongue worms *Listriolobus pelodes* (Allan Hancock, 1965). More recent surveys in the general area have suggested that the population may not have maintained the large numbers (MMS, 1983). The nearshore environment contains: Maples Reef, a productive kelp area, used for scientific study by University of California at Santa Barbara; Goleta slough estuary, also studied by UCSB; and Santa Barbara Harbour.

Deferral of the Santa Barbara Channel Ecological Preserve and Buffer Zone would reduce impacts to water quality in the adjunct to the Santa Barbara Channel Ecological Preserve. There may be a reduction of impacts to large populations of the benthic organism Listriolobus pelodes. The risk of impacts resulting from an oil spill striking the breeding and roosting colonies of seabirds and harbor seal pupping grounds of Santa Cruz and Santa Rosa Islands would be slightly reduced. The deletion would also reduce the probability of an oil spill reaching the relatively unaltered estuary Goleta Slough near Santa Barbara. Impacts to fish, commercial fisheries, sport fisheries, and recreational resources in and around Santa Barbara would be reduced slightly.

(c). San Nicolas Navy Operating Area

The San Nicolas Navy Operating area consists of approximately 152 blocks in an area between San Nicolas Island to the west, Santa Barbara Island to the north, and San Clemente to the east. The southern boundary is approximately 20 miles southwest of San Clemente Island.

This area is used by the Navy primarily for ASW air, surface and submarine coordinated operations training, hazardous operations designed to provide sea room with instrumented facility for exercising new ASW long range sensor and weapon capabilities, Air, surface and submarine weapon and sonobuoy expenditure, low altitude aircraft operations and live ordnance.

During much of the year ninety percent of the entire southern California bight population of Xantu's Murrelets are concentrated in an area of less than 3,000 Km2 around Santa Barbara Island. The endangered brown pelican forages widely over this area and also breeds on Santa Barbara Island. San Nicolas Island is the preferred site for the translocation of a threatened southern sea otter population. The primary reason for the translocation effort is the existing risk of an oil spill within the otters present range.

Deferral of the San Nicolas Navy Operating area would eliminate 152 blocks from the Southern California planning area. This would eliminate impacts to military uses within this subarea. However, overall impacts to military uses would remain the same as the Proposal. The level of impacts to marine mammals or coastal and marine birds inhabiting the area would remain the same as the proposal. The risk of an oil spill impacting some species would be lessened somewhat due to creation of geographic buffers near sensitive areas such as Santa Barbara and San Nicolas Islands.

The above species, and others, which are particularly vulnerable to oil would be provided additional protection from accidental oil spills by the presence of a geographic buffer which would remove potential sites for an oil spill away from the immediate area and provide added time for oil spill containment and weathering for spills occuring outside the area.

b. Unavoidable Adverse Impacts

Unavoidable adverse impacts for the Southern California Planning Area are the same as described for Oregon/Washington (Section IV.B.7.bl. In particular, the southern sea otter and California brown pelican could suffer significant adverse impacts but the level is dependent on where and when spills occured.

c. Relationship Between Short-Term and Long-Term Uses of Man's Environment

The relationship between short-term uses of the environment and long-term productivity for Southern California are the same as described for the Oregon/Washington Planning Area (Section IV.B.7.c).

d. Irreversible and Irretreivable Committment of Resources

The proposal to lease blocks does not by itself result in the irreversible and irretrievable commitment of any resources. However, if oil and gas resources are explored, found and developed, the proposal is expected to result in the eventual irreversible and irretrievable commitment of 462 million barrels of oil and 726 billion cubic feet of gas since, once these resources are produced and used, they will not be available for use at a future time.

It is possible that accidental oil spills may contact sea otter habitat in southern California. Breeding brown pelicans could suffer similar ecological losses. This could contribute to the irreversible impacts described for Central California (Section IV.B.9.1).

Due to existing levels of OCS and state tidelands developments, activities in this area are probably closer to any threshold that may cause migrating gray whales to shift their migratory routes. This threshold level, if one exists, is currently unknown.

Other irreversible and irretreivable commitment of resources are the same as described for the Oregon/Washington Planning Area (Section IV.B.7.d.).

e. Impacts of a High Case Scenario

This section provides a discussion of the potential environmental impacts that could occur in the unlikely event that all unleased, undiscovered, economically recoverable hydrocarbon resources in the Southern California planning area are leased and developed as a result of the proposal.

The estimated "High Case" hydrocarbon resources for the Southern California planning area are as follows: 1,260 million barrels of oil and 1,930 billion cubic feet of gas. Infrastructure expected to be used to explore and develop these resources includes 557 exploration and delineation wells, 1,275 development wells, and 27 platforms. This is a substantial change from the "Base Case" (462 million barrels of oil and 726 BCF of gas, 207 exploration and delineation wells, 475 development wells, and 10 platforms).

The oil spill model estimates the total number of oil spills greater than 1,000 barrels expected to occur as a result of total development is four. There is a 99 percent probability that one or more large (1,000 bbls or greater) spills may occur as a result of the total development in the Southern California planning area.

In the unlikely event that total hydrocarbon resources for the Southern California planning area are leased and developed, impacts to plankton and intertidal benthos are expected to be the same as is stated for the base case. All other resource impact levels, with the exception of commercial fishing and marine vessel traffic, are expected to remain the same as described for the cumulative case. Although increases in impacts are anticipated to occur to some of these resources, primarily as a result of more concentrated activity and increased oil spill risk, these increases are not deemed significant enough to warrant movement to a higher category.

The primary causative agent for increased impacts to commercial fisheries and marine vessel traffic will be the significant increase in OCS related vessel activity. Increased oil spill risk is a secondary factor, as is the increased number of offshore platforms.

Increased OCS-related vessel activity will result in increased vessel movement conflicts in areas where seismic, supply, and crew boat use will be concentrated. There will also be increased demand on available harbor space and services, unless or until additional space is provided. The potential increase in oil spill risks will increase the potential for fouling of harbors and delaying and/or rerouting of maritime shipping. Increasing platform numbers will reduce available traffic movement space. Therefore, the expected level of impacts to marine vessel traffic from the "high" case scenario is high.

Commercial fisheries, dependent on fishing vessel movement and ports for its existence and well-being, will suffer increased levels of the same kinds of potential impacts as discussed above for marine vessel traffic.

Additional losses are also expected to set gear. Trawl fisheries will suffer reduced grounds availability. Increased oil-fouling of all gear and harbors is a distinct possibility. Seismic exploration activity hazards are also expected to increase. The expected level of impacts to commercial fisheries given this scenario is moderate, although local impacts could be very high.

f. Alternative II - Subarea deferrals

Most of the 13 subareas considered for deferral in this Alternative are in the southern California planning area. therefore, the impacts from this alternative in the Southern California planning area are the same as described in Alternative I.

g. Impacts of Alternative III - Add a sale in the Straits of Florida

The addition of a lease sale in the Straits of Florida planning area to the leasing schedule in Alternative I would have no environmental implications in this planning area.

The impacts from this alternative in the Southern California planning area are the same as described in Alternative I.

h. Impacts of Alternative IV - Biennial Leasing

This alternative would provide for scheduling biennial sales in the Southern California planning area. Under the proposal (Alternative I) two sales would be scheduled for the Southern California planning area (one in 1987 and one in 1990). The number of sales would increase to three (one in 1987, one in 1989, and another in 1991) for this alternative.

Estimated hydrocarbon resources for Alternative IV in the Southern California planning area are as follows: 524 million barrels of oil and 823 billion cubic feet of gas. Infrastructure expected to be used to explore and develop these resources includes 231 exploration and delineation wells, 525 development wells, and 11 platforms. Predicted oil and gas resources, and infrastructure are approximately 10% to 12% higher than those predicted for Alternative I (see Table IV.B.10.d.-1).

The assumed number of oil spills remains the same as for the proposal. Overall, the expected impact levels of this alternative remain the same as for Alternative I for all resources, due to the relatively small increases in impact-producing factors.

i. Impacts of Alternative V - Acceleration Provision

This alternative assumes the acceleration of leasing from triennial to biennial sales in this planning area. (see Chapter II.A.5. for a detailed discussion of this Alternative). However, no lease sales would be added to the schedule. The two lease sales for the Southern California planning area will remain. The first lease sale identified for 1987 will remain the same as the proposal. However, the second sale would move from 1990 to 1989.

Estimated hydrocarbon resources for Alternative V in the Southern California planning area are as follows: 400 million barrels of oil and 629 billion cubic feet of gas. Infrastructure expected to be used to explore and develop these resources includes 176 exploration and delineation wells, 400 development wells, and 10 platforms. Predicted oil and gas resources, and infrastructure are approximately 13% to 14% lower than those predicted for Alternative I (See table IV.B.10.e.-1).

The assumed number of oil spills remains the same as the proposal. Since there would be a very small reduction in resource estimates and exploration and development assumptions, impact will for this alternative are not expected to differ significantly from those described for Alternative I. However, due to the acceleration of sales, impact-leasing factors could be present in the planning area at an earlier time.

j. Impacts of Alternative VI - Defer Leasing in Six Planning Areas: North Atlantic, Washington and Oregon, Northern California, Central California, Southern California, and North Aleutian Basin

Selection of Alternative VI would defer leasing delay this 5-year program in all planning areas of the Pacific Outer Continental Shelf. The impacts resulting from this alternative would be the same as described for Alternative VII (No action) for the Southern California planning area.

k. Impacts of Alternative VII - No Action

Under this alternative, the Secretary of the Interior proposes not to schedule any oil and gas lease sales for this proposed 5 year program. All potential impacts to the physical, biological, and socioeconomic environment resulting from hydrocarbon exploration, development, and production would be eliminated.

Oil and gas are currently the nation's primary energy source. Even with a vigorous conservation program the United States demand for energy will continue to grow. With the adoption of Alternative VII the oil and gas that would have been available as a result of this proposed program would no longer contribute to the national domestic production during the life of the program.

With the removal of the potential oil and gas into the national energy reserves, it would necessitate the increased production of energy from other conventional and non-conventional energy sources (See Appendix C), and/or increases in import levels from foreign sources. Section II.A.7 contains a summary of environmental impacts of these alternative energy sources.

Alternative VII would eliminate the contribution, from the Southern California planning area, of 462 million barrels of oil and 726 BCF of gas to the domestic energy production. This represents approximately 3.5 quadrillion Btu. The energy potential of this quantity of oil and gas will have to be replaced by alternative energy sources.

Impacts resulting from the exploration, development, and production of these resources would be eliminated.

The exploration and development of oil and gas has been in existence in the Southern California planning area since 1896. Changes to the physical, biological, and socioeconomic resources without the proposal would still occur. Many of the changes to the environment will be the result of other projects which are planned for or are currently existing in the planning area. Impacts are expected as a result of previous Federal and State lease sales,and importation of oil via tankers to refineries in the area, as well as other expansions associated with hydrocarbon and non-hydrocarbon development (See section IV.B.10.a.(1) and (2).

11. Gulf of Alaska

a. Alternative I:

The proposal is to hold 1 sale in the Gulf of Alaska in the 5-year period (1987-1991). It is estimated that the sale will produce about 113 million barrels of oil and 1,751 billion cubic feet of gas over a 35-year period. These resources will be produced from 42 production wells from 1 platform. In addition to the oil and gas, about 270 million barrels of formation water (makeup unknown) will be produced. Approximately 262,000 drilling muds and fluids and 580,000 barrels of drill cuttings could be discharged into the sea over the life of the proposal. This will affect about 15 hectares around the platform.

About 12 exploration wells will be drilled. It is anticipated that support bases will be expanded and that at least 1 onshore facility would be expanded. OCS exploratory vessels and production platforms would discharge drilling fluids in bulk quantities along with lower level releases of petroleum hydrocarbons and sanitary wastes from waste water discharge sources. The OCS production platforms also would discharge bulk quantities of petroleum formation waters. Discharge of drilling muds (262,000 barrels) and drilling cuttings (578,000 barrels) for the proposed sale are projected from the development scenarios (IV.A.2.).

(1) Interrelationship of Proposal with Other Projects and Proposals

The Federal Coastal Zone Management Act (CZMA) and Alaska Coastal Management Act (ACMA) were enacted in 1972 and 1978, respectively. Through them valuablecoastal resources may be protected from planned developments and activities. Policies of the Alaska Coastal Management Program (CMP) may be refined and supplemented through local coastal programs prepared by coastal districts (Table IV.B.11.a.1-1) according to State guidelines and standards. Upon adop tion of a district program by the Alaska Coastal Policy Council, district policies replace those of the State CMP only when they are more explicit. Frequently, district policies supplement those of the State. As a result, State policies retain relevancy even after district programs are developed.

Alaska includes within the CMP boundary all areas where current or future uses will have a direct and significant effect on coastal waters. Since the definition is functional, the coastal boundary usually extends inland to include coastal watersheds which support stream habitats for anadromous fish. Offshore, the State is constrained to the 3-mile limit of State jurisdiction. Federally owned lands within the coastal zone also are excluded; however, CMP policies may regulate private lands within Federal refuges as long as the policies are consistent with the refuge management plans. State standards which, typically, are most relevant to activities hypothesized in this EIS include those addressing coastal habitats; air, land, and water quality; historic, prehistoric, and archaeological resources; coastal development; geophysical-hazard areas; recreation; energy facility siting; transportation and utilities; mining and mineral processing; and subsistence.

(2) Projects Considered in Cumulative-Impact Assessment

The following projects have been considered for the Gulf of Alaska, Kodiak, Cook Inlet and Shumagin planning areas.

The following previous Federal offshore lease sales could cumulatively affect the Gulf of Alaska Region if oil or gas is discovered and produced in these areas and is transported by tanker through the Gulf of Alaska.

Lease Sale 60 - Lower Cook Inlet/Shelikof Strait Lease
Lease Sale BF - Beaufort Sea
Lease Sale 71 - Diapir Field
Lease Sale 57 - Norton Sound
Lease Sale 70 - St. George Basin
Lease Sale 83 - Navarin Basin
Lease Sale 87 - Diapir Field

Also included in the Department of the Interior's final 5-Year Oil and Gas Leasing Schedule (July 1982) are the following lease sales which could affect the study area:

Lease Sale 89 - St. George Basin
Lease Sale 92 - North Aleutian Basin
Lease Sale 100 - Norton Sound

In addition, sales that may be held, because of this proposed 5-year schedule, if they produce oil and gas resources, would have a cumulative effect on the Gulf of Alaska Region. If any of these areas are leased and oil or gas discovered and produced, tankers may transport the product through the Gulf of Alaska.

The State of Alaska has held several lease sales near the proposed Federal lease-sale area in the Gulf of Alaska/Cook Inlet. However, at present, the only production of oil close to the proposed lease sale area is from State leases in upper Cook Inlet. Most of the oil from upper Cook Inlet is transported by tanker from Kenai/Nikiski through lower Cook Inlet and the Gulf of Alaska.

The State of Alaska's January 1984 5-year oil and gas leasing schedule (1984-1988) lists 15 upland and offshore oil and gas sales. One is scheduled for Cook Inlet; none are scheduled for the Gulf of Alaska. If discoveries and production result from any of the State's lease sales, it is possible that this oil could be tankered through the Gulf of Alaska and/or Cook Inlet. The cumulative-effects analyses in this EIS assume the possibility that oil could be transported through the Gulf of Alaska and/or Cook Inlet; however, the analyses are treated qualitatively since no resource estimates or scenario assumptions are available with regard to State sales.

Trans-Alaska Pipeline oil transported by tanker through the Gulf of Alaska from Valdez accounts for most of the existing tankering through the Gulf of Alaska. Some tankering of oil from Kenai/Nikiski (Cook Inlet/Gulf of Alaska) also occurs. Both situations contribute risk of adverse effect on the biological/human environment of the area due primarily to potential oil spills.

(3) Physical Environment

(a) Impact on Water Quality

Agents most likely to affect water quality are deliberate discharges from platforms, oil spills, dredging, and gravel-island construction. These agents and their generic effects have been discussed extensively in Section IV.B.3. of the Artic Sand and Gravel FEIS (USDOI,MMS, 1983), Section IV.G.5. of the Diapir Field (June 1984) Lease Offering FEIS (USDOI,MMS,1984a), Section IV.B.7. St. George Basin Sale 89 FEIS (April 1985), (USDOI,MMS,1985), and Section IV.H.E. Norton Basin Sale 100 DEIS (March 1985), (USDOI,MMS,1985), (USDOI,MMS,1985).

Drilling muds used offshore of Alaska are relatively nontoxic. In exploratory discharges, only drilling mud concentrations of barium are expected to be more than 100-fold greater than background sediment concentrations. Concentrations in production well discharges are expected to be of similar magnitudes (ECOMAR Marine Consulting, 1983).

The ECOMAR study demonstrates that effects on water quality are to be expected only in the immediate vicinity of discharges. Deposition of drilling muds was not detectable less than 200 meters down-current of discharges.

Discharged drilling muds would not stay where initially deposited. They would continue to be reworked, dispersed, and, therefore, diluted. An EPA study suggests that despite decreased circulation under ice cover, dilution of drilling-mud discharges at 300 meters from the source would be roughly 100-fold greater than during open water (Jones and Stokes Associates, Inc., 1983). The greater dilution is a least partially attributable to greater sedimentation of drilling mud very close to the discharge point with the lesser turbulence and lower water velocities that occur under ice cover.

Dredging may be used to prepare foundations for production platforms and may be used for trenching and burial of subsea pipelines. Pipeline installation would involve the greater overall volumes of dredged materials.

High turbidity plumes would extend about 1 kilometer down-current of dredging sites. At this distance, turbidity levels to the upper range of ambient concentrations. Because current direction shifts with the wind, effects from dredging would be very local in the vicinity of the dredging and would occur only during periods of actual dredging (summer months) for pipeline and platform emplacement.

Intermittent dumping of large volumes of shore-mined gravel introduces particulate matter into the marine environment and disturbs the bottom sediments. Most of the discharged material descends rapidly to the seafloor. The remainder, about 7 percent, composed of the fine-grained silt and clay particles, will enter the suspended transport system. Movement by waves and currents would be the same as for naturally suspended sediment particles. The increase in the concentration of sediment particles in the water column is expected to affect a relatively small area for a short period of time. Dispersion and settling reduces the concentration of particulate matter downstream from any discharge and sediment disturbance sites.

Experience with dredging or dumping operations in other areas shows a decrease in the concentration of suspended sediments with time (2-3 hours) and distance downstream 1-3 kilometers) from the discharge. In the dredging operations associated with artificial-island construction and harbor improvement in the Canadian Beaufort Sea, the turbidity plumes tended to disappear shortly after operations ceased, and generally they were not spatially extensive (Passah, 1982); sand was the predominate material moved.

The sites, duration, and amount of turbidity depends on the grain-size composition of the discharge, turbulence in the water column, and current regime. However, the turbidity would not be expected to extend further than a 3-kilometer radius about the construction site of the gravel island, or about 28 square kilometers.

Dumping from barges intermittently introduces a large volume (up to several thousand cubic meters) of sediment into the water column in a very short period of time. This action also creates a density current, but it is generated by a larger initial mass and is short-lived when compared to the density currents associated with a continuous discharge operation. No more than about 28 square kilometers would be affected by this short-lived turbidity.

Discharges will be regulated through a general or individual National Pollutant Discharge Elimination System (NPDES) permit from EPA. Prior to issuing NPDES permits for discharges in ocean waters, under Section 402 of the Clean Water Act (NPDES permits), EPA must complete an Ocean Discharge Criteria Evaluation (ODCE) and determination pursuant to Section 403 of the Clean Water Act. This evaluation must be based on environmental information specific to the proposed lease area, and must conclude whether the proposed discharge(s) will cause "unreasonable degradation of the marine environment." If such a conclusion cannot be reached, then to allow discharge the evaluation must conclude that the proposed discharge(s) will not cause "irreparable harm" to the marine environment while they are being monitored to determine their actual fate and effects.

The EPA considers that these permit conditions will limit effects on water quality to a mixing zone of 100-meters radius about each discharge point. During peak exploration and delineation, about 15 hectares of the proposed sale area would have impaired water quality over some portion of the year. Such impairment would exist during periods of actual discharge but would rapidly dissipate afterwards. In waters less than 10 meters deep, a 100-meter mixing zone may not be sufficient for adequate dilution. In the very shallow water above the Endicott Reservoir in the Beaufort Sea, for example, EPA believes a 2-kilometer mixing zone may be necessary.

The formation water that would be produced in later years as the field declines would likely be reinjected into the formation to preserve pressure. If produced waters are appreciably toxic, EPA could prohibit their discharge.

In addition to these permitted and planned discharges, accidental oil spills will likely occur. Because of unavoidable chronic and accidental discharges of oil, measurable degradation of existing pristine water quality is likely to occur in the study area. Plumes of dissolved hydrocarbons from a 100,000-barrel spill could be detectable over the low background levels for perhaps 100 kilometers, or possibly 500 kilometers if under ice (Cline, 1981). If the spilled oil were of a composition similar to that of Prudhoe Bay crude, about 40 percent of the spilled could persist for 1 to 2 years in dispersed tar balls. A major spill of such size, however, is very unlikely to occur. Other smaller, but more likely spills, could increase dissolved hydrocarbon concentrations only in limited areas and for short periods. Regional long-term degradation of water quality below state and federal standards because of hydrocarbon contamination is very unlikely.

Sediment resuspension is likely to occur as a result of setting anchors for semisubmersible exploratory rigs and driving piles for production platforms. The amount of sediment resuspended from these activities will be negligible and restricted to the area immediately around the specific activity, and will likely be reduced to background levels within several hundred meters down current from the activity.

In addition to the siting of rigs and platforms, if oil is found pipelines could be emplaced to transport produced oil and gas to a transshipment facility. Pipeline-construction activities would result in the resuspension of sediments along the route of the pipeline; however, these sediments would rapidly settle following completion of activities in a specific area. If entrenchment of the pipeline occurred, sediment could be displaced along the pipeline route over the construction period.

In the Gulf of Alaska anchoring of exploration or the one projected production platform and entrenchment of a pipeline would increase turbidity only temporarily over a limited area. The discharge of an estimated 270 million barrels of formation waters, 262,000 barrels of drilling muds and fluids, and 580,000 barrels of drill cuttings could result from anticipated exploration and production activities. These site-specific discharges could result in high impacts within a few meters to tens of meters from the discharge source; however, these will decrease to low with distance (1 km) fro the source. Production discharges would continue intermittently over 30-35 years. The one predicted oil spill of 1,000 barrels or greater could significantly, but temporarily, increase water-column-hydrocarbon concentrations over several hundred kilometers.

CONCLUSION: Impacts on water quality from the proposal would be low.

CUMULATIVE IMPACTS: Oil and gas leasing in the territorial waters of this region would yield waste-water discharges (about 1 million barrels of formation water). These effects are likely to be very low. It should be noted, however, that it is not possible to estimate the amount of these additional volumes in the absence of site-specific information on the volume of effluent loading, the contaminants being discharged, and the mixing characteristics of the receiving waters. Cumulative water-quality effects from subsequent development proposals will be evaluated in future EIS's on major actions. Cumulative effects on water quality in the Gulf of Alaska are not likely to increase due to OCS exploration and development. However, 10 spills 1,000 barrels or greater all are predicted in the cumulative case based primarily on the transportation of oil through the Gulf. If these spills do happen over 30-35 years there will be some degradation of water quality.

CONCLUSION: Cumulative effects on water quality in the Gulf of Alaska are estimated to be low.

(b) Impacts on Air Quality

Agents which are most likely to affect air quality are nitrogen and sulfur dioxide resulting from normal operations, and precipitation and accidental emissions. These agents and their generic effects have been discussed in Section IV.G.7. of the Diapir Field (June 1984) Lease Offering FEIS (USDOI, MMS, 1984a), and Section IV.H.6. of the Norton Basin Lease Sale 100 DEIS (March 1985). The following generic discussion is included here to provide a basis for a single source of reference to the air quality analysis for each Alaska planning area.

The major source of nitrous-oxide emissions during exploration is the exhaust of diesel engines on drilling vessels. Should exemption levels be exceeded, emission of nitrous oxides could be reduced by either of two strategies.

Emissions could be reduced below exemption levels through available pollutant-control technologies. Alternatively, the lease-holders could drill directionally from a little further offshore because exemption levels increase with distance from shore, or make agreements to sequentially rather than simultaneously drill inshore blocks near the federal/state inshore boundary. Uncontrolled emissions near shore could exceed the exemption level for nitrous oxides during drilling, construction, and production, and exceed the exemption level for volatile organic compounds during production.

Uncontrolled emissions for nitrous oxides and volatile organic compounds which exceed exemption levels would require industry to either perform additional air-quality analyses prior to any development and/or incorporate emission controls to reduce nitrous oxide and volatile organic compound emissions. No such massive emissions result from oil and gas production. The onshore emission sources in the relatively remote areas of Alaska can be expected to be no greater than existing ambient concentrations in the Kenai/Nikiski area, where petroleum production, refining, gas liquefaction, and marine loading occur. Support activities for terminal operations are expected to produce very low air emissions. The Kenai/Nikiski area meets Class II PSD standards.

Background coastal tundra nitrogen budgets are on the order of 0.11 kilograms of nitrogen per square kilometer (Prentki et al., 1980), or about 7.8 metric tons nitrogen per year for the entire North Slope of Alaska. The fraction of total emitted nitrogen oxides that would be blown inland from offshore platforms and then deposited on coastal tundra may be very small. Potential consequences could include but would not be limited to changes in plant species composition and productivity.

Coastal tundra is extremely vulnerable to acidification. A major potential consequence of increased emissions of nitrous and sulfur oxides would be acidification of local tundra. Potential acidity of emitted nitrogen and sulfur would be sufficient to acidity runoff from the equivalent of 64,000 square kilometers of coastal tundra. Whether any significant acidification actually occurred, however, would depend upon the proportion, rate, chemical form, and area extent of pollutant fallout and also upon the acid-buffering capacity of the tundra ecosystem.

Deposition would be spread over a tremendously large area--over distances of hundreds to thousands of kilometers from each emission site--(both local or regional), acidification damage would be very likely to result from the proposal.

Accidental emissions result from gas blowouts, evaporation of spilled oil, and burning of spilled oil. Large emissions, however, are rare and are unlikely to occur a result of the proposal.

A gas blowout could release 20 metric tons per day of gaseous hydrocarbons, of which about 2 metric tons per day would be non methane hydrocarbons and, therefore, classified as volatile organic compounds (Stephens et al., 1977). In the event that a gas blowout occurred, it would be unlikely to persist more than 1 day, and it would very likely release less than 2 metric tons of volatile organic compounds.
Oil spills are a second accidental source of gaseous emissions. If a 20,000-barrel spill occurred, 900 to 1,800 metric tons of gaseous hydrocarbons, or 90 to 180 metric tons of volatile organic compounds could be lost to the atmosphere, mostly within the first few days of a spill.

Smaller spills of less than 1,000 barrels occur more frequently than larger spills. Gas or oil blowouts may catch fire. In addition, in situ burning is a preferred technique for cleanup and disposal of spilled oil. For catastrophic oil blowouts, in situ burning may be the only effective technique for spill control.

Burning affects air quality in two major ways. For a gas blowout, burning would reduce emissions of gaseous hydrocarbons by 99.98 percent and very slightly increase emission--relative to quantities in other oil and gas industry emissions--of other pollutants.

If an oil spill is ignited immediately after spillage, the burn can combust the 33 to 67 percent of crude oil of higher amounts of fuel oil which otherwise would evaporate. On the other hand, incomplete combustion injects oily soot and minor quantities of other pollutants into the air.

Coating portions of the ecosystem in oily residue is the major but not the only potential air-quality risk. Oily residue in smoke plumes from crude oil is mutagenic, but not highly so (Sheppard and Georghiov, 1981). Only burns of spills of about 20,000 barrels or greater magnitude are likely to noticeably contaminate land which would be at minimum 5 kilometers from the proposed sale area. Any contamination could also be washed away by subsequent rain and therefore would be temporary. In addition, air-quality standards at any specific location would be very unlikely to be exceeded.

In the Gulf of Alaska planning area effects on air quality from the proposal are expected to be low based upon estimated emissions of offshore exploration (3 wells per year for 4 years) and production activities (1 production platform) and potential onshore facilities (one) in an area of pristine air quality. Projected peak emissions would not exceed state or federal air-quality limitations unless concentrated nearshore in small areas. In that event, existing control technology would ensure attainment of standards, although air quality would not be absolutely pristine near facilities. Air-quality effects for the proposal are expected to be analogous to those identified for Lease Sales 46 (Kodiak; USDOI, BLM, 1980) and 60 (Lower Cook Inlet-Shelikof Strait; USDOI, BLM, 1981 and 88 (Gulf of Alaska/Cook Inlet, USDOI,MMS,1984). Onshore emissions would also be subject to federal PSD review and modeling.

CONCLUSION: Direct effects on air quality from activities of the proposal would be low.

CUMULATIVE IMPACTS: Cumulative effects of offshore emissions also are expected to be low. The cumulative amount of offshore emissions which could occur nearshore may be estimated by combining with the Gulf of Alaska the emissions projected from Cook Inlet, Kodiak, and Shumagin Planning Areas (1 production platform in each planning area). The combined production-related emissions would exceed Department of the Interior air-quality-analysis exemption levels for all pollutants only if all operations were located at common boundaries (not physically possible) within 5 kilometers (3 miles). Conceivably emissions from the Cook Inlet, Kodiak and Shumagin planning areas could be combined.

Cumulative air quality effects would be seen in Yakutat or Cape Suckling as a result of the shipping of natural gas from an LNG facility. This facility would have to meet all federal and state air quality standards and Class II PSD standards and, as such, control technology would be required.

Again, because an oil-storage and marine-loading terminal would be required to meet State and Federal ambient air-quality and Class II PSD limitations, no unavoidable effects on air quality are foreseen.

CONCLUSION: Cumulative effects of the proposal on air quality would be low.

(4) Biological Environment

(a) Impact on Plankton and Benthos

The estimated level of production activity (42 wells from 1 platform) and the limited radius of effects would result in negligible effects on planktonic and benthic organisms. Diluted discharges of formation waters and drilling muds, and cuttings (about 270 millions barrels, 262,000 barrels and 577,000 barrels respectively spread out over the 35-years life of the proposal) from offshore locations in the lease area might cause lethal or sublethal effects on organisms using pelagic areas including scallops, adult shrimp, other invertebrates, and their planktonic food web organisms. These discharges, however, will affect only a small portion of these widespread populations, and could result in minor effects on regional planktonic and benthic populations.

One offshore oil spill is estimated. It could result in limited mortality, primarily on adult (pelagic) shrimp and planktonic food web organisms. Even a major oil spill is expected to result in only a minor effect on regional populations. A major oil spill which contacted nearshore areas being used by planktonic eggs or larvae of shrimp, clams, scallops, or other invertebrates could result in moderate effects on these species, depending on the portion of a local population present, the life stage, areal extent of the spill, the concentration of hydrocarbons, and length of exposure. Shrimp at their current depressed population levels could be particularly vulnerable to moderate effects. There is, however, a relatively low probability (37%) of an oil spill resulting from this proposal.

Only a major spill which contacted and exposed nearshore areas to lethal concentrations of hydrocarbons when vulnerable life stages were present in those areas could be expected to produce a moderate effect on a portion of a local population.

Nearshore areas are used by concentrations of spawning adults, planktonic larvae, and juveniles using shallow waters. Larvae are particularly sensitive to hydrocarbon exposure, experiencing lethal concentration at .01 ppm (USDOC, 1983). During the most sensitive period, the molt, larvae exposure to 8 ppb of napthelene experienced narcosis and death (USDOI, 1981).

In addition, chronic exposure of clams to hydrocarbons can result in inability to attach to the substrate, a depressed rate of shell closure resulting in more exposure to predation, and inhibition of oxygen uptake.

Oil spills which reach nearshore waters could affect the clam resources of the Gulf of Alaska lease area. Many razor clam were killed following the Amoco Cadiz tanker spill off the coast of France (USDOI,1981).

CONCLUSION: Impacts of this proposal on regional populations are expected to be low. Impacts on the local population would be moderate.

CUMULATIVE IMPACTS:

Activities which may produce cumulative effects on planktonic and benthic organisms include other Federal and State ongoing and proposed petroleum development, commercial fishing operations, and other nonpetroleum-industry activities. Section IV.A.1 continues a listing of hydrcarbon related activities, other activities are continued in the section that they occur.

The oil-spill risk (10 projected over 35 years) in the Gulf of Alaska planning area increases substantially as a result of including the effects of tankering from Valdez, Cook Inlet, and Kodiak with the effects of the proposal. Cumulative spill effects tend to be greatest at locations where tanker traffic may be concentrated (e.g., Hinchinbrook Entrance). There is only one production platform projected for each planning area in the Gulf of Alaska region. Oil and gas resource estimates are low for all four planning areas in the Gulf of Alaska region.

Regional shrimp and razor clam populations using areas in the vicinity of Hinchinbrook Entrance and Controller Bay could experience moderate effects as a result of the cumulative factors in comparison to the low effects expected from the proposal. Other areas in Southeastern Alaska are not expected to experience greater effects than the LOW effects expected from the proposal.

CONCLUSION: The cumulative impacts would be low for regional population. Local populations could experience moderate impact.

(b) Impacts on Fish Resources

The assessment of effects on fish resources has been divided into sections on salmonids, herring, groundfish and crab.

Salmonids: The five species of Pacific salmon and the steelhead trout may be affected by seismic activity, drilling discharges, and oil spills because of activities of the proposal.

Present seismic activity has been found to be relatively harmless to fish. The peak pressure is relatively low and is distributed intermittently over short time periods (once every 5 to 10 seconds), with sound pulse directions measured in milliseconds. Wienhold and Weaver (1971) exposed caged coho salmon smolt to varying airgun-pressure detonations at distances of 1, 4, and 5 meters from both a single airgun and a linear arrangement of eight airguns.

No mortalities or injuries were observed during the 72-hour period following the testing. They concluded that airguns used in this configuration were non-injurious to coho of this size, but that more comprehensive studies were warranted. Falk and Lawrence (1975) exposed Arctic Coregonids (whitefish) to seismic airguns in the waters of the MacKenzie River Delta and found that the airgun has a potentially lethal radius of 0.6 to 1.5 meters under most conditions. Therefore, the projected level of seismic activity and the limited radius of effects would result in negligible effects on salmonids.

Diluted discharges of formation waters and drilling muds, cuttings, and fluids from offshore locations in the planning area could have a minor effect on adult salmonids in pelagic areas. Drilling muds, cuttings, and fluids contain toxic components including trace metals, biocides, and petroleum hydrocarbons in varying compositions and concentrations. Bacteriocides in drilling fluids (e.g., halogenated phenols, diomine salts, quarternary amines) can be quite toxic, having LC50 values of less than 1 ppm (USDOI, 1981). Toxicity bioassays for marine organisms exposed, in situ, to drilling muds and cuttings show relatively high LC50 levels. Salmonids had LC50's ranging from 4,000 to 190,000 ppm and shrimp showed an LC50 of 1,400 ppm (B.C. Research, 1976; Dames and Moore, 1978). Other LC50 values for species or tested in the lower Cook Inlet COST well study including amphipods, mysids, isopods, and brine shrimp larvae ranged from 500-2,000 ppm (Dames and Moore, 1978).

Although drilling muds, and cuttings, (about 262,000 and 580,000 barrels, respectively, over 30-35 years) may have potential lethal toxicities, there is considerable evidence that lethal concentrations are only present within a 100 to 300 meters of a discharge point and result in little mortality of marine organisms. Gerber et al. (1980) reported that lethal concentrations of drilling muds would be present only within a few meters of a discharge. Therefore, these discharges will generally have very low, if any, effects on salmonids.

An oil spill (one over 1,000 barrels estimated) which contacted nearshore areas being used by prespawning adults, fry, and juveniles could result in a moderate effect on a local population. Salmonids are more sensitive than benthic fish species to hydrocarbon exposure having 96-hr TLM's of 1-3 ppm (Wilson, 1972; Rice et al, 1979). Newly emerged salmon fry are the most susceptible life stage (Rice et al., 1975; Moles et al., 1979). Pelagic adults in the upper water column may contact an offshore oil slick or the water-soluble fraction below a slick, and experience mortality or sublethal effects.

Salmon may avoid areas contaminated by hydrocarbons. Studies have shown that various life stages of salmon can detect even sublethal hydrocarbon concentrations (Rice, 1973; Weber et al., 1981) and may avoid such areas. Adult salmon avoided concentrations greater than 3.2 ppm, but passed through concentrations up to 3.2 ppm (which approach acutely toxic levels) (Weber et al., 1981). Smolting coho avoid concentrations half that avoided by presmolt coho (Maynard and Weber, 1981). Avoidance of home spawning streams due to an oil spill which contacted estuarine areas could have an adverse effect on portions of a population by reducing spawning. Malins et al. (1978) found that salmon's homing ability was delayed, but not prevented, by contact with hydrocarbons. Hydrocarbon concentrations in open-water areas following a spill are usually less than 1 ppm, and such concentrations would not divert migrating salmon.

Only an oil spill (37% probability of one or more spills of 1,000 barrels or more) which contacted and exposed nearshore areas to lethal concentrations of hydrocarbons when vulnerable life stages were concentrated in those areas is expected to produce a moderate effect on a portion of a local population. The aggregate lethal and sublethal effects of seismic activities, drilling and production discharges, and other oil spills are expected to affect only localized groups of salmonids in the immediate vicinity of such events.

CONCLUSION: Impacts of this proposal on regional population of salmonids are expected to be low. Impacts on local population could be moderate.

CUMULATIVE IMPACTS: Activities which may produce cumulative effects on salmonids include other Federal and State ongoing and proposed petroleum development, commercial fishing operations, and other nonpetroleum industry activities.

In the northern Gulf of Alaska, oil from existing and proposed arctic sales tankered from the TAPS terminal at Valdez, together with this proposal production from Cook Inlet, Kodiak, and Shumagin planning areas) and potential production of State and Federal leases increase the combined probabilities of one or more spills (10 estimated over 35 years) occurring and contacting some areas. The proposal, existing leasing, and existing tankering generally show an increase in spill probabilities for Hinchinbrook Entrance, Yakutat Bay, and Controller Bay.

Salmonids using the Copper and Bering Rivers in these areas may experience increased effects as a result of the increased cumulative risks for Controller Bay and Hinchinbrook Entrance. Salmon migrating coastally from Kayak Island to Dry Bay may also experience increased effects as a result of the increased cumulative probability for Yakutat Bay.

CONCLUSION: Salmonid populations using areas in the vicinity of Hinchinbrook Entrance, Yakutat Bay, and Controller Bay could experience moderate impacts. Impacts in other areas utilized by salmonids in Southeastern Alaska would be low.

Herring: The proposal includes some areas with concentrations of herring. Adults and spawning activity have been reported in Southeastern Alaska, and Prince William Sound (Blackburn, 1980).

The expected level of seismic activity and the limited radius of effects would result in very low effects on herring. Diluted discharges of formation waters (about 270 million barrels) and drilling muds, and cuttings, (about 840,000 barrels over 30-35 years) from drilling platforms in the planning area could have a low effect on adult herring in pelagic areas. These discharges (the closest wold be 3+ miles from shore) would have very low effects on nearshore herring. An oil spill (1 projected) which contacted nearshore areas being used by spawning adults, eggs, larvae, and juveniles could result in a moderate effect depending on the portion of a local population present, the areal extent of the spill, the concentration of hydrocarbons, and the length of exposure. There is, however, a low probability (3.7) of an oil spill resulting from this proposal.

Only an oil spill which contacted and exposed nearshore areas to lethal concentrations of hydrocarbons when vulnerable life stages were concentrated in those areas is expected to produce a moderate effect (i.e., affect a portion of a local population). The aggregate lethal and sublethal effects of seismic activities, drilling and production discharges, and other oil spills are expected to affect only localized groups of herring in the immediate vicinity of such events. Given the extensive distribution and numbers of herring in the Gulf of Alaska/Cook Inlet, the localized effects resulting from this proposal are not expected to result in a change in regional populations and should result in a low overall effect. If an oil spill occurs and contacts nearshore areas while spawning adults, roe, larvae, and juveniles are present, a regional populations effect could result.

CONCLUSION: Impacts of this proposal on regional populations of herring are expected to be low. Impacts on local population could be moderate.

CUMULATIVE IMPACTS: Activities which may produce cumulative effects on herring include other Federal and State ongoing and proposed petroleum development, commercial fishing operations. The oil-spill risk in the Gulf of Alaska planning area increases substantially as a result of including the effects of tankering from Valdez and the other Gulf of Alaska region planning area with the effects of the proposal. Herring use Prince William Sound for spawning and may experience increased effects as a result of the increased cumulative oil-spill probability for Hinchinbrook Entrance.

CONCLUSION: Herring populations using Prince William Sound could experience moderate impacts. Other important areas in Southeastern Alaska used for herring spawning are not expected to experience greater effects than the low impacts.

Groundfish: Seismic activity associated with exploration assumptions (12 exploration wells, 1 platform, 2 pipelines) and the expected limited radius of effects would result in very low effects on ground fish. Diluted discharges of formation waters and drilling muds, and cuttings, from offshore locations in the planning area could have a low impact on adult groundfish using deep-water areas (very low dilution rates of 10,000: 1) have been found to occur within 100 meters of a discharge point). An offshore oil spill which did not contact nearshore areas would result in limited mortality. Groundfish are generally less susceptible to hydrocarbons than pelagic fish (Wilson, 1972; Rice et al., 1979). USDOC (1983) found that juvenile and adult flatfish experienced lethal concentrations of the water-soluble fraction of hydrocarbons at 5 ppm, as compared to lethal concentrations for egg and larval stages of 0.1 to 1.0 ppm. Since the concentrations of hydrocarbons in oil-polluted waters are usually less than 1 ppm (Malins and Hodgins, 1981), adult groundfish are not likely to experience much effect from an oil spill, particularly given their deep-water habitats. The limited size of even a major oil spill could result in only a low impact on groundfish populations. An oil spill which contacted nearshore areas being used by concentrations of groundfish could result in a moderate effect on groundfish species depending on the portion of a population present, the areal extent of the spill, the concentration of hydrocarbons, and the length of exposure. Reduced stocks of halibut and sablefish could be particularly vulnerable to moderate effects. There is, however, a relatively low probability of an oil spill resulting from this proposal and subsequently contacting these nearshore areas.

If the one estimated oil spill contacts and exposes nearshore areas to lethal concentrations of hydrocarbons when vulnerable life stages were concentrated in those areas it is expected to produce a moderate effect on a portion of a local population.

Given the extensive distributions (see Table III.A.11.c(4)) and numbers of groundfish in the Gulf of Alaska, the localized effects resulting from this proposal are not expected to result in a change in regional populations, and should result in a low overall impact.

CONCLUSION: Impacts of this proposal on regional populations of groundfish are expected to be very low. For local population, the impact would be moderate.

CUMULATIVE IMPACTS: Activities which may produce cumulative effects on groundfish include other Federal and State ongoing and proposed petroleum development, commercial fishing operations, and other non-petroleum industry activities.

The oil-spill risk in the Gulf of Alaska planning area increases substantially (10 spills over 1,000 barrels) as a result of including the effects tankering from Valdez and other areas with the effects of the proposal. Groundfish using the areas around Yakutat or Prince William Sound may experience increased effects as a result of the increased cumulative risks for Yakutat Bay and Hinchinbrook Entrance. Halibut using those nursery areas near Yakutat and from Fairweather Grounds to Icy Bay are most likely to experience increased effects from cumulative activities.

CONCLUSION: Halibut populations using areas in the vicinity of Hinchinbrook Entrance and Yakutat Bay could experience moderate impacts. Other areas used by groundfish in Southeastern Alaska are expected to experience low effects.

Crab: The level of seismic activity associated with exploration assumptions e.g., 12 exploration wells, 1 platform, 1 gas and 1 oil pipeline, and the limited area of effects would result in very low effects on crab. Diluted discharges of formation waters and drilling fluids, muds, and cuttings from offshore locations in the planning area might cause lethal or sublethal effects on crab. These discharges, however, will affect only a small portion of these widespread larval drift populations, and could result in low effects on regional crab populations. A offshore oil spill which did not contact important nearshore areas could result in a low effect on crab populations. Crabs are affected by hydrocarbons. For example, post-molting tanner crab were observed to lose a number of legs following oil exposure and subsequently die an 'ecological death' being unable to survive in the normal environment (Karinen and Rice, 1974). Low concentrations of hydrocarbons can also result in reductions in fecundity (Tatem, 1977) or behavioral aberrations, such as the elimination of pheromone-induced mating stances which can reduce reproductive success (Takahashi and Kittredge, 1973). Consequently, a major oil spill which contacted nearshore areas being used by breeding adults could result in moderate effects on crab species depending on the portion of a population present, the life stages present, areal extent of the spill, the concentration of hydrocarbons, and the length of exposure. King crab at their current depressed population levels could be parti-cularly vulnerable. There is, however, a relatively low probability (37%) of the one oil spill projected from this proposal. Only a major oil spill which contacted and exposed nearshore areas to lethal concentrations of hydrocarbons when vulnerable life stages were concentrated in those areas is expected to produce a moderate effect on a portion of a local population.

Given the extensive distributions and numbers of King, Tanner and Dungeness crabs in the Gulf of Alaska, the localized effects resulting from this proposal are not expected to result in a change in regional populations and should result in a low overall effect.

CONCLUSION: Impacts of this proposal on regional populations of crab are expected to be low. Impacts on local populations could be moderate.

CUMULATIVE IMPACTS: Activities which may produce cumulative effects on crab include other Federal and State ongoing and proposed petroleum development, commercial fishing operations, and other nonpetroleum-industry activities.

The oil-spill risk in the Gulf of Alaska lease area increases substantially from 1 spill to 10 over 1,000 barrels or more over 35 years as a result of including the effects of tankering from Valdez and other areas with the effects of the proposal. (Gulf of Alaska region)

Cumulative spill effects tend to be greatest at locations where tanker traffic may be concentrated (e.g., Hinchinbrook Entrance, Yakutat Bay).

CONCLUSION: Regional crab populations in the vicinity of Hinchinbrook Entrance, or Yakutat Bay, could experience moderate effects. Other areas in Southeastern Alaska used by crab could experience low effects.

(c) Impact on Marine Mammals:

Ten species of nonendangered marine mammals--Pacific harbor seal, steller sea lion, northern fur seal, sea otter, killer whale, Dall's porpoises, harbor porpoise, minke whale, beluga whale, and Pacific whitesided dolphin commonly occur in a portion of or throughout the Gulf of Alaska Planning Area and are very likely to have some interaction with OCS industrial activities. Oil pollution and disturbance due to increased human activity and habitat alterations could adversely affect marine mammal populations found in the planning area. This section briefly discusses the nature of effects of oil and disturbance on marine mammals that commonly occur in the proposal area. The reader is directed to OCS Report MMS85-0031 (Hansen, 1985) for a detailed discussion of the various possible direct and indirect effects of oil and other chemical pollutants on marine mammals.

Direct contact with spilled oil may cause mortality of some mammals and have no apparent long-term effect on others, depending on factors such as species involved, age, and physical condition of the animal. Sea otters, fur seals, polar bears, and newly born seal pups are likely to suffer direct mortality from oiling through loss of fur/water repellency and subsequent loss of thermo-insulation resulting in hypothermia (Kooyman et al., 1976, and Costa and Kooyman, 1980). Of the above species, sea otters are probably the most vulnerable to loss of thermal insulation due to oiling because they rely entirely on their fur for thermo-insulation, while fur seals polar bears, and other pinniped pups possess some subdermal fat layers, depending on age and physical condition. Adult harbor and spotted

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seals, and walrus are likely to suffer some temporary adverse effects, such as eye and skin irritation with possibly some temporary adverse effects, such as eye and skin irritation with possible infection. Such effects may increase physiological stress and perhaps contribute to the death of some individuals (Geraci and Smith, 1976; Geraci and St. Aubin, 1980). Deaths attributed to oiling are more likely to occur during periods of natural stress, during molting and times of fasting, food scarcity and disease infestations. The few recorded mammal deaths attributed to oil spills in case histories occurred during winter months--a season on increased natural stress (Duval et al., 1981).

Oil-spill contact with pinnipeds and sea otters could interfere with oil factory senses, and hydrocarbons in the water column or in sediments could affect possible chemoreception in marine mammals. Oiling of pinniped fur could mask olfactory recognition of young pups by nursing females. The sense of smell has been reported to be important in mother/pup bonds in harbor seals (Renouf et al., 1983) and probably is important in other seals. Benthic feeders, such as walrus and bearded seal, may rely on chemoreception in locating food. Contamination of bottom sediments may interfere with prey identification in contaminated habitats.

Although species-specific effects of oil contact on nonendangered cetaceans are uncertain, studies of hydrocarbon effects on dolphins and porpoises as representative odontocetes by Geraci and St. Aubin (1982) provide sufficient insight on potential effects of oil-spill contact on smooth skinned cetaceans.

The finding of these experiments suggest that smooth-skinned cetaceans such as beluga whales, dolphins, porpoises, and killer whales could suffer some minor skin damage if they were confined to a small surface area contaminated with oil (such as an ice lead). However, such effects on the skin are likely to be short-term or transient (oil is unlikely to remain adhered to the skin), with recovery occurring within a few days (Hansen, 1985).

Oil ingestion by marine mammals through consumption of contaminated prey and by grooming or nursing could have pathological effects, depending on the amount ingested and the animal's species physiological state. Death would be likely to occur if a large amount of oil were ingested or if oil were aspirated into the lungs. Ingestion of sublethal amounts of oil can have various physiological effects on a marine life mammals depending on whether the animal is able to excrete and/or detoxify the hydrocarbons. Geraci and Smith (1976) demonstrated that seals are able to excrete as well as absorb oil. Both seals and cetaceans potentially can metabolize oil through the function of an oxygenase enzyme complement (Engelhardt, 1983) demonstrated as cytochrome p-450 in the liver of cetaceans (Geraci and St. Aubin, 1982), and as aryl hydroxylase in the liver and kidney tissues of seals (Engelhardt, 1982).

Nonendangered marine mammals are not likely to avoid oil spills intentionally, although they may limit or avoid further contact with oil if they experience discomfort or apprehension as a result of contact with an oil slick (Hansen, 1985). Under some circumstances, they may be attracted to the spill site of concentrations of food organisms present, or they may have little choice but to move through the spill site during migration.

The indirect consequences of oil pollution on marine mammals would be those associated with changes in availability or suitability of various food sources. Toxic-pollutant levels from oil spills and other industrial discharges that are concentrated enough to cause large scale die-offs of prey could occur near the immediate spill site or in other localized areas where pollutants have accumulated. Toxic pollutant levels from oil that could become trapped in sediments, and could have long-term sublethal effects on prey organisms, are also more likely to affect localized areas rather than expansive habitat areas. Because they generally live year-round within limited home ranges or territories and feed generally on sedentary benthic prey, sea otters are probably the species most sensitive to adverse changes in locally available food sources. If an oil spill widely contaminated bottom sediments, walrus, which feed primarily on sedentary benthic organisms, also may be affected by possible population reduction or contamination of clams or other prey organisms within habitat areas. Oil-pollution effects on the pelagic and epitremhic prey of seals, sea lions, and fur seals and nonendangered cetaceans are likely to temporarily reduce the numbers or availability of these food sources within localized areas near the immediate spill site and in areas where the oil slick is found. Because seals and sea lions, and cetaceans are very versatile in diet and exhibit highly mobile foraging habits, adverse effects of oil on prey species are likely to have little effect on these marine mammal populations in general.

The most likely effects of gas production in the planning area would come from noise and disturbance associated with aircraft to and from the production platform and, to a lesser degree, from LNG tanker traffic passing to and from the assumed facility. The additive temporary displacement of sea otters, harbor seals, and sea lions near vessel and air traffic from gas development activities is likely to cause no more than a minor or temporary change in marine mammal distribution. Effects of noise and disturbance on marine mammals and alterations in the availability of some food organisms due to gas-production-platform installation and pipelaying are likely to be short-term and local during the construction period and of minor consequence. If an LNG accident or natural gas blowout occurred, with possible explosion and fire, marine mammals in the immediate vicinity probably would be killed, particularly if the explosion occurred under the water surface. LNG accidents are extremely rare; natural-gas-platform blowouts do occur on occasion. Natural gas and condensates that did not burn in the blowout would be highly toxic and would kill organisms exposed to high concentrations. However, natural gas vapors and condensates would be dispersed very rapidly from the spill site. It is not likely that they would affect any marine mammals except individuals present in the immediate vicinity of the spill. For any marine mammals to be exposed to lethal concentrations of gas vapors or condensates, the spill would have to occur below or on the surface of the water, not from the top of the drill platform. The effects of natural gas blowouts on seals and sea otters are likely to be very low to regional populations. However, an LNG tanker-accident explosion could have a greater effects. Thus, the effect of

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natural and of LNG development and transportation on nonendangered marine mammals is likely to be low.

Offshore activities that may disturb marine mammals are caused mainly by airborne or underwater noise and human presence. Major sources of mobile-airborne noise disturbance are low-flying aircraft and high-speed motorboats, as well as other high-frequency, high-pitched sounds. Low-flying aircraft are known to panic hauled-out seals. If such disturbance occurs at pinniped rookeries during the pupping season, a significant increase in pup mortality and reduced pupping success are likely to occur (Johnson, 1977). Disturbed adult seals are likely to crush pups when they stampede into the water, and nursing females are likely to abandon their pups during the first 3 weeks of nursing if disturbance separates the mothers and pups. If seals and sea lions are frequently disturbed during the molting period at haulout areas, the successful regrowth of skin and hair cells may be retarded. The physiological stress on seals and sea lions would thus increase during an already stressful periods. Aircraft-noise disturbance of cetaceans from flyovers generally is very transient, with events not lasting more than a few seconds (Stewart et al., 1982). Such brief disturbances are not likely to have any serious consequences to nonendangered cetaceans. Other sources of airborne noise include drill platforms, pipelaying, and onshore support facility construction and operations. These noises may disturb marine mammals within a few kilometers sources of these sources; however, underwater noises borne from some of these sources could influence marine mammals over a larger area.
The primary sources of industrial underwater noise include marine vessels, aircraft, drill rigs, and offshore production and processing facilities. Underwater noise may affect marine mammals by disturbing or alarming the mammals and causing them to flee the sound sources. For example, Fraker et al. (1978) reported the startled response and flight of beluga whales 2,400 meters from barges and boats traveling through a whale concentration area. Underwater noise also may interfere with or mask reception of some marine mammal low-frequency-communication signals, or interfere with reception of other environmental sounds used by marine mammals for navigation (Terhune, 1981). Intense noise could damage the hearing of marine mammals or cause them other physical or physiological harm (Geraci and St. Aubin, 1980; Hill, 1978). Frequent and/or intense noise that causes a flight or avoidance response in marine mammals could permanently displace animals from important habitat areas.

The presence of sea lion, elephant seal, sea otter, and cetacean populations in close proximity to human development and intensive industrial activity and marine-vessel traffic along the California coast and the presence of sea lions and seal and beluga whales near commercial fishing traffic in Bristol Bay and Cook Inlet strongly suggests that some marine mammals have adjusted to human development activities with no apparent adverse effects. However, some species of marine mammals, such as fur seals, are probably more sensitive to human presence and disturbance, particularly during the nursing and breeding seasons. The presence of sea otter populations in close proximity to human development and intensive industrial activity and marine-vessel traffic along the California coast strongly suggests that this species has adjusted to most human development activities with no apparent adverse effects. Playback recordings of industrial noise, and actual seismic sounds from airguns had no apparent effect on California sea otters (Riedman, 1984). Sensitive species may adjust to human presence and industrial noise to a certain degree, with a portion of the population remaining in industrial areas. Noise and disturbance could conceivably exceed the tolerance level of sensitive species and may eventually displace these species' entire populations from development areas; however, such permanent displacement has not been demonstrated.

Sea otters, numbering over 10,000, are the population of marine mammals at greatest risk from oil spills associated with oil activities in the Gulf of Alaska. Sea otters are likely to suffer direct mortality from oil-spill contact and may be affected by local reduction in the availability of food sources due to oil pollution. Sea otter harbor seal, and sea lion populations occurring in the Prince William Sound-Yakutat area may be at risk of oil-spill contact from the proposal. If, for example, an oil spill contacted sea otter concentration in the Cordova area or along Montague Island several hundred to several thousand could be killed. Considering their relatively slow dispersal rate to available habitats, the recovery of the sea otter population to previous levels, in this habitat area, would probably take one generation. Thus, this loss could be considered a moderate impact on the Gulf of Alaska regional sea otter population.

There is a 37% probability of one or more spills of 1,000 barrels or more. Moderate impacts on fur seals are possible if several tens of thousands of fur seals were contaminated from a possible tanker accidention the Gulf of Alaska Coast-However, such high losses are unlikely. Along their migratory pathway, fur seals could experience some oil spill effects in southeast Alaska and the northern Gulf of Alaska. These effects could occur in certain areas at any time but most likely from April through June during spring migration. Overall effects on the fur seal population are expected to be low along the migratory pathway and very low further offshore and inshore of their migration route in the Gulf of Alaska because of their scattered and widespread distribution during migration such that large numbers of fur seals are not likely to come in contact with even a large oil spill which would become highly weathered and dispersed-within ten days of the spill release.

Although several thousand harbor seals, sea lions, and cetaceans could be exposed to an oil spill in the proposal area, fewer number (in the hundreds, at most) are likely to come in direct contact with a spill; and only weakened or highly stressed individuals are likely to be seriously injured or to die as a result of the spill. Some local pinnipeds could be displaced if haulout and breeding sites were temporarily contaminated representing low impacts.

Harbor seals inhabiting major breeding and haulout habitats in Icy Bay, Yakutat Bay, Copper River Delta, Cape St. Elias, and other area could be exposed to some noise and disturbance from the helicopter and support-vessel trips centered out of onshore support or development facilities. Sea lions breeding on Graves and Forester Islands may be disturbed by some aircraft overflights. However, noise and disturbance from aircraft and vessel traffic would be very transitory and brief in duration. The frequency of disturbance is likely to be low and of little apparent consequence, unless pupping activities are disrupted. Disturbance of harbor seal and sea lion rookeries during the pupping season could significantly reduce pup survival. However, the Marine Mammal Protection Act and existing regulations could help to prevent excessive disturbance of harbor seals and other marine mammals. Thus, overall levels of disturbance effects are likely to be low.

Noise and disturbance from air and boat traffic and seismic-geophysical exploration activities with offshore oil and gas activities in the Gulf of Alaska could cause brief startle, annoyance, and/or flight responses of whales, dolphins, and porpoises. However, such responses are highly variable depending on the level of noise and on several environmental factors discussed above. Industrial noise may have several other potential effects such as masking mammals communication and interfering with echolocation. It is unclear whether these effects would occur or if cetaceans would adjust to industrial noise. However, the continued presence of dolphins, porpoises, and whales in coastal marine habitats with high levels of industrial activity and frequent marine traffic (such as Cook Inlet) strongly suggests that nonendangered cetaceans are able to adjust to man made noise and disturbance. Present knowledge of cetacean behavior in association with industrial noise sources suggests that effects of disturbance on nonendangered cetaceans are likely to be very low. Construction activities associated with the proposal (installation of the oil and gas platforms and offshore pipeline) are likely to have short-term or very low effects on cetaceans with any avoidance of drill platform sites or pipeline routes by whales or other marine mammals subsiding after construction activities are complete.

CONCLUSION: This proposal could have moderate effects on sea otters, low effects on pinniped species, and probably very low effects on nonendangered cetaceans.

CUMULATIVE IMPACTS: The additive effects of other ongoing and planned projects, as well as the proposal on nonendangered marine mammals are discussed in this section. Although the probability of any or all planned and ongoing projects reaching developmental stages is generally unknown, this analysis assumes that all such projects do reach developmental stages. These projects could affect marine mammals by oil spills, noise and disturbance, and by habitat alteration.

Projects that could have cumulative effects on marine mammals include State of Alaska ongoing and proposed oil and gas development in Cook Inlet and on the Kenai Peninsula, TAPS oil tankering, proposed federal OCS lease sales in Cook Inlet, Kodiak, and the proposal in the Gulf of Alaska, and existing commercial marine and air traffic. Prior to 1972 oil tankering to and from Cook Inlet probably had low effects on marine mammals when some small oil spills had occurred and untreated tanker ballast was discharged into the Gulf of Alaska waters; however, present EPA regulations have greatly reduce this source of hydrocarbon pollutants and present oil development effects on marine mammals are probably very low or negligible. No oil spills have been associated with TAPS tankering (several billion barrels) to present. However, oil tankering that may be associated with the proposed 1987-91 scheduled sales (Cook Inlet, 179 million barrels; Kodiak, 95 million barrels; and Gulf of Alaska, 113 million barrels) would increase the risk of one or more oil spills occurring and contacting marine mammals and important habitat areas. General increases in marine traffic associated with other projects would increase the chance of ship collisions and other hydrocarbon spills (such as fuel oil, bunker-c oil, etc spills). Three spills may be more likely to occur along major shipping routes such as at Stevenson Entrance to Cook Inlet or Hinchinbrook Entrance to Prince William Sound. If a large tanker spill occurred in either of these areas substantial numbers of sea otters (perhaps a few to several thousand) could be killed representing moderate effects on the regional sea otter population while pinnipeds and cetaceans probably would suffer low and very low effects respectively. Noise and disturbance associated with increases in marine traffic and increases in aircraft asociated with cumulative oil development and increases in the human population in southcentral Alaska would result in the temporary and perhaps long-term displacement of marine mammals particularly seals and sea lions from haulout sites and rookeries that are near-adjacent to air and/or vessel traffic routes. If the air and/or vessel traffic is frequent enough to cause long-term or permanent displacement of a portion of a species regional population to a less favorable habitat (haul-out-rookery site) impacts could be moderate to very high if the species population was reduced and the recovery to its former level took 10 years or more (very high impacts). However, pinnipeds, and other marine mammals populations may habituate to cumulative sources of noise and disturbance after perhaps a few years such that these effects are likely to be moderate. Marine mammals could also be incrementally affected by changes in abundance and distribution of prey species due to commercial fishing in the Gulf of Alaska particularly if bottom fisheries are established. Pinnipeds and other species populations may suffer cumulative population declines associated with the loss of high numbers of animals entrapped in discarded fishing gear or losses from active gill net fisheries.

Oil spills (from OCS activities or marine traffic), noise, and disturbance, (resulting in temporary or long term displacement of marine mammals), long-term changes in abundance of prey (due to commercial fishing), and population losses (due to discared fishing gear or losses due to gill nets) could have cumulative moderate to very high impacts on populations of nonendangered marine mammal occurring in the Gulf of Alaska.

CONCLUSION: The proposal is likely to have no more than moderate impacts on sea otters and pinnipeds and low impacts on nonendangered cetaceans.

(d) Impact on Coastal and Marine Birds

The following is a discussion of potential adverse effects that are applicable to each of the eleven planning areas on the Alaska Outer Continental Shelf (OCS). Potential adverse effects to coastal and marine birds from proposed activities on the Alaska OCS could come from oil spills, noise and disturbance associated with offshore and onshore construction, and from support related activities. Birds that spend much time on the surface (e.g., shear waters, cormorants, sea ducks, alcids) are especially vulnerable to oil spills (King and Sanger, 1979). The effects of oil spills on birds are well-documented. For a detailed discussion of the nature of these effects, refer to Alaska OCS Technical Paper No. 3, (Hansen, 1981).

Direct oil contact is usually fatal or, in addition to indirect effects, causes substantial mortality. Oiling of birds causes death from hypothermia, shock, or drowning. Oil ingestion through preening of oiled feathers significantly reduces reproduction in some birds and causes various pathological conditions. Oil contamination of eggs by oil-fouled feathers of parent birds also significantly reduces egg hatching. Birds may be affected indirectly by oil spills if food resources decline as a result of hydrocarbon-induced mortality or displacement. Even a relatively short-term adverse effect on a major food resource during the nesting period, migration stop over, or in an overwintering area could decrease reproductive success or survival of local bird populations. Contamination of food resources and habitats over longer periods could result in the accumulation of toxic concentrations of hydrocarbon residues that may adversely affect physiology, reproduction, and behavior.

Abnormalities in reproductive physiology and behavior resulting from ingestion of oil (Hartung and Hunt, 1966; Holmes and Cronshoaw, 1977; Patten and Patten, 1977; Stickel and Dieter, 1979; Ainley et al., 1981; Holmes, 1981; Peakall et al., 1981; Gorsline and Holmes, 1982; Leighton, 1983; Leighton et al., 1983; Holmes, 1984) potentially could have substantial adverse effects on egg production in seabird and waterfowl populations. In addition, transfer of oil from adults to eggs results in reduced hatchability, increased incidence of deformities, and reduced growth rates in young (Grau et al., 1977; Albers, 1978; Miller et al., 1978; Szaro et al., 1978; Patten and Patten, 1979; Stickel and Dieter, 1979). Reduction in growth also may result indirectly when affected parents fail to deliver sufficient food to nestlings (Trivelpiece et al., 1984). Holmes et al. (1978) has shown that stress from ingested oil can be additive to ordinary environmental stress (e.g., low temperature). Presumably, the effects of external oiling also would be more severe when birds are under environmental stress (winter) or physiological stress (molting and migration). Seabird population models (Wiens et al., 1979; Ford et al., 1982; Samuels and Lanfear, 1982; Wiens et al., 1984) project that recovery periods as long as 20 to 50 years may be required if the breeding adults of groups such as alcids and storm petrels, which are characterized by very low reproduction rates, suffer substantial losses from a major spill. A major oil spill coincident with a period of high natural mortality (caused by limited food resources, etc.) could substantially increase bird mortality and retard natural recovery of the population. Recovery of colonies exposed to chronic hydrocarbon presence resulting in decreased reproductive success could be equally a slow (Holmes et al., 1981; Ford et al., 1982). In general, long-term effects on birds from oil pollution from OCS activities could cause some population reductions depending on the species involved, the level of habitat contamination, the enforcement of existing mitigating measures, and the effectiveness of oil-spill cleanup and protection measures. Long-term, gradual reduction in available food sources on at least a local level in contaminated areas is a possibility leading to displacement or reduction in bird populations.

In pelagic areas, helicopter and vessel traffic to drill rigs or platforms would constitute the most important source of disturbance affecting marine birds. Onshore, air traffic, human presence, and activities associated with construction and operation of support facilities near seabird colonies and waterfowl and shorebird staging and nesting areas can significantly disrupt breeding activities and preparation for migration. Nesting birds may be subjected to increased predation pressure from gulls and foxes whose populations may increase if supplementary food (garbage) becomes available at onshore support facilities. Construction and operation of onshore facilities may encroach upon wildlife habitat causing nearby breeding areas to be abandoned during such activities. Low-flying aircraft, especially helicopters; can frighten large numbers of cliff-nesting birds (e.g., murres) from the nesting ledges, resulting in displacement of eggs and/or young to the rocks below. Those not displaced from the ledges by adults are left exposed to the elements and predators (Hunt, 1976; Hunt, 1978; Jones and Petersen, 1979). In recent years, repeated aircraft flights near several colonies in the Bering Sea region may have been one factor contributing to fewer nesting attempts and reduced reproductive success (Hunt, 1978; Biderman and Drury, 1978). Disturbance of birds in important feeding, staging, and overwintering areas can cause excessive expenditure of energy and displacement to less favorable habitats during critical periods in the annual cycle.

The effects of an oil spill on birds would vary with season, duration, volume, and composition. Winter spills in the Gulf of Alaska could affect over-wintering ducks and crested auklets, together with some loons, grebes, cormorants, seaducks, eagles, gulls, and alcids which are year-round residents. In addition to the year-round residents, fulmars, shearwaters, storm petrels, geese, dabbling ducks, shorebirds, and alcids could be affected by summer spills. Ducks, geese, shorebirds, and alcids would be the groups most adversely affected by spills during spring and fall migration. Embayments containing marshes or major river deltas and nearshore areas where prey organisms are concentrated are the most vulnerable habitats.

In the lower Cook Inlet/Shelikof Strait region, seabird populations nesting in the Barren Islands could experience high effects if an oil spill were to enter this area from April through October.

In northern Gulf of Alaska, seabird populations nesting on Middleton Island could experience high effects if the one projected oil spill were to occur in this area from April through October. An oil spill occurring near Yakutat Bay could result in high effects to the large Aleutian tern nesting population. Elsewhere, moderate effects could result if spills contacted the Chiswell Islands. There could be low effects at Montague Island, or Controller Bay.

During spring migration any oil spill entering the Controller Bay/Copper

River Delta/Orca Inlet area could have high effects on millions of migrant waterfowl, shorebirds, and other marine birds which stop here. The probability of spilled oil from the proposal is low 37%). Migrant birds stopping in Yakutat Bay and adjoining areas could experience moderate to high effects from oil spills depending on the species involved.

During the breeding season, oil-spill effects on dusky Canada geese and trumpeter swans nesting on the Copper River Delta area and soutn could be high. Oil-spill effects on most other populations are likely to be low. In fall and winter, oil-spill effects also are expected to be low.

In Southeast Alaska, oil spills contacting seabirds nesting on Forrester and St. Lazaria Islands could result in high effects to these populations, which are of regional as well as statewide importance. Elsewhere along the outer coast, oil-spill effects on nesting seabirds would be low. Six waterfowl and seabird species present along the Inside Passage either in winter or during spring migration could experience moderate effects should an oil spill occur (37% probability) but effects on other species are likely to be low. Aside from potential effect on large shearwater flocks inhabiting the Gulf of Alaska, oil spills would have low effect on bird populations using offshore waters.

CONCLUSION: Effects of the proposal on regional populations of coastal and marine birds are expected to be moderate.

CUMULATIVE IMPACTS: While many seabirds do not undertake extensive migration, some do migrate through or overwinter in or near other planning areas and, therefore, are subject to an increased oil-spill risk. Most waterfowl and shorebirds are highly migratory and thus likely to migrate through, overwinter in, or breed near other State or Federal lease areas. Spills and/or disturbance which adversely affect breeding stocks of certain seabird species at more than one major colony also could result in a significant reduction of their regional populations.

Other factors which may make a substantial contribution to cumulative effects include mortality resulting from birds accidentally captured in salmon driftnet, the long-term effects of habitat degradation, disturbance, and possible alteration or reduction of prey species populations. A combination of such factors could result in significant declines of regional seabird populations.

CONCLUSION: Where highly concentrated biological resources (e.g. Middleton Island) are coincident with high cumulative risk of oil-spill contact or other adverse effects, high effects could be experienced by marine bird populations. Regional marine and coastal bird populations using most of planning area could experience moderate effects as a result of cumulative factors, however.

(e) Impact on Endangered and Threatened Species:

As defined in the Endangered Species Act of 1973, an endangered species is any species which is in danger of extinction throughout all or a significant portion of its range, whereas a threatened species is a species which is likely to become endangered within the foreseeable future.

Endangered marine mammals associated with the Gulf of Alaska are the blue, fin, gray, humpback, right sei, and sperm whales. Endangered birds known to occur in or adjacent to this planning area are the Aleutian Canada goose, American peregrine falcon and the short-tailed albatross. The arctic peregrine falcon is listed as threatened species. There are no plant species listed as threatened or endangered adjacent to the planning area.

Practically the entire population of gray whales migrates through the Gulf of Alaska planning area with peak numbers passing southbound in December and northbound in May (Malme et al 1984). The area population of humpback whales relies heavily on certain protected waters of the Gulf of Alaska planning area in order to feed. Seasonal feeding by humpbacks is well known in Prince William Sound, Glacier Bay, and Frederick Sound. Other endangered species of whales occur in this planning area but not in large concentrations.

Potential effects of oil and gas exploration and development upon these species fall into two generic categories which are summarized separately: hydrocarbon pollution and acoustic disturbance. This summarization of detail discussions in Alaskan OCS lease sale EIS's in provided as a single source and reference to possible impacts in all Alaskan planning areas.

Cetaceans occupy surface waters to breathe, and some to feed, potentially exposing them to spilled oil by contact, inhalation, or ingestion (Geraci and St. Aubin, 1982). There is little evidence that endangered cetaceans are able to detect hydrocarbon pollution. Captive studies with bottlenose dolphins indicate that toothed whales may be more likely to detect oil due to certain sensory capabilities (Geraci and St. Aubin, 1980).

Behaviorial responses of cetaceans to oil in the natural environment have only recently been observed (Geraci and St. Aubin, 1982). Swimming speeds, surfacing and diving times, and respiratory rates of small groups of gray whales migrating through an area containing naturally occurring oil seeps were compared to the presence and extent of oil. Typically, the whales were observed swimming through the oil at a modified speed, but without a consistent pattern. Geraci and St. Aubin (1982) noted some changes in the respiration behavior of whales when they were in oil-contaminated areas. In oiled waters, the whales seemed to spend less time at the surface, blowing less frequently but at a faster rate. If this reaction is interpreted as an avoidance response, it suggests that gray whales can detect oil. Whales showing no response either could not detect the amount or type of oil present or were indifferent to it (Geraci and St. Aubin, 1982). A study by Kent et al. (1983) observing migrating gray whales in the vicinity of oil seeps near Coal Oil Point, California, found that most whales observed showed apparent indifference to the oil. Other times whales were observed to radically change their swimming direction. There appears to be an offshore movement away from the oiled areas. This movement offshore could be an adaptive avoidance response to oil reflecting long-term exposure to such seeps by the population. It is clear that gray whales do travel through these areas without apparent harm.

The nature of cetacean skin suggests that they may be vulnerable to the effects of surface contact with hydrocarbons (Geraci and St. Aubin, 1979). The epidermis is not keratinized but is composed of live cells (Geraci and St. Aubin, 1979). However, some evidence exists that the bowhead whale's skin is keratinized (Albert, 1981). Geraci and St. Aubin (1979) reported that cetacean epidermis is virtually unshielded from the environment and may react to substances such as crude oil and gas condensates in a manner similar to sensitive mucous membranes.

More recent laboratory studies by Geraci and St. Aubin (1982) revealed that bottlenose dolphin skin exposed to gasoline and crude oil showed no gross evidence of damage or loss of integrity, with restoration of normal skin color within 2 hours after exposure. Histological and ultrastructural examinations showed that crude oil and gasoline produced mild and transient damage to the dolphins' epidermal cells, with signs of cellular recovery occurring within 3 to 7 days. A similar experiment, in which skin wounds on one animal were exposed to crude oil for up to 60 minutes, had no apparent effect on the healing process.

The findings of the above experiments suggest that smooth-skinned cetaceans can suffer some minor skin damage if they are confined in an area contaminated with oil (such as ice lead); however, such effects on the skin are likely to be short-term or transient (oil is unlikely to adhere to the skin), with recovery occurring within a few days (Geraci and St. Aubin, 1982).

Oil possibly may adhere to rough areas on the skin surface of gray, right, and bowhead whales; some oil adherence to preserved skin was reported in lab tests (Haldiman et al., 1981). The length of time that oil may adhere to rough-skin features depends on the behavior of the affected whales as well as environmental factors (such as water temperature and water movement over the contaminated areas, and the state of the oil).

Oil contact with pinniped eyes for 24 hours causes severe irritation that may lead to permanent eye injury if exposure is prolonged (Geraci and Smith, 1976). Cetaceans may be equally sensitive to eye/oil contact; however, cetacean-eye exposure to surface oil or near-surface oil/water emulsions is likely to be very brief. Albert (1981) suggested the possibility of oil droplets becoming entrapped within the large conjunctival sac surrounding the bowhead whale's eye; however, based on the few examinations and dissections of bowhead whales, there are no reported observations of foreign bodies found in the conjunctiva.

In addition to potential cutaneous contact with hydrocarbons, inhalation of toxic substances have been cited as possible threats to cetaceans. Certainly the former is a possibility to the extent that whales may be in the vicinity of a spill prior to the evaporation of toxic compounds. The massive Nowruz slick (Iranian oil field) is the only instance in which an oilspill was shown to cause the death of marine mammals. This spill, caused by the wartime destruction of three separate wells, heavily oiled several small offshore islands (in territorial waters of Saudi Arabia), and the marine life there has been severely affected. The Water Resources and Environment Division of the University of Petroleum and Minerals Research Institute in Dhahran, Saudi Arabia, conducted necropsies on the dead animals and found they had died of respiratory stress, presumably as a result of inhaling oil (Oil Spill Intelligence Report, 1983a). Virtually the entire known Gulf population of the endangered dungong (50 individuals) has died since the Nowruz spill began.

Geraci and St. Aubin (1982) suggested that the more toxic volatile fractions of crude oil evaporate more quickly. They suggested that within 2 to 4 hours of being exposed to the air, the oil would have lost most of these vapors and the vapors in the adjacent air would be down to less harmful levels. The effects of gas condensate or gas-vapor inhalation on cetaceans may result in respiratory stress. Cetaceans that are already stressed by lung and liver parasites and adrenal disorders might be particularly vulnerable to the effects of even low levels of hydrocarbon vapors (Geraci and St. Aubin, 1982). If a spill occurred and such natural weathering factors as diffusion, dispersion of the slick, wind, and a more gradua -C10 substances) were taken into account, it is unlikely that vapor concentrations could reach critical levels for more than a few nours (Geraci and St. Aubin, 1982). It is unlikely that cetaceans would stay in a harmful environment for any length of time.

Plugging of the blowhole of cetaceans has been cited as a possible threat but would be very unlikely to occur. The typical breathing cycle of cetaceans involves an "explosive" exhalation followed by an immediate inspiration and an abrupt closure of the blowhole (Geraci and St. Aubin, 1979). This mechanism prevents inhalation of water and should be discriminatory of gas condensates and oil; however, toxic hydrocarbon gas could be inhaled.

Concern has also been expressed that oil globules which may be swallowed could block the entrance to the third stomach. Albert (personal communication) indicated that this opening can be as large as 5.1 centimeters (cm) (inside diameter). Examinations of the esophagus (Albert, 1981) indicated that this opening is generally around 3 cm (inside diameter). It does not seem likely that oil globules large enough to block the entrance to the third stomach would pass through the esophageal opening. The largest food item recovered from a bowhead stomach was an 8-gram snail with dimensions of 3.4 cm x 2.6 cm (Lowry and Frost, 1984), which indicates that these openings can stretch to accommodate larger items.

Cetaceans exposed to an oil spill might conceivably ingest small quantities of hydrocarbons on different occasions over an extended period of time, either directly through filter (baleen) feeding and/or indirectly through consumption of contaminated prey. Cetacean vulnerability to hydrocarbon ingestion would vary with species, type of hydrocarbon, the nature of the spill, and the amount ingested. There are few studies of the consequences of oil ingestion in marine mammals, and none establishing critical or lethal doses (Geraci and St. Aubin, 1982). Caldwell and Caldwell (reported in Geraci and St. Aubin, 1982) found that chronic ingestion of small amounts of hydraulic oil and mineral oil, fed daily to dolphins over a 3-month period, did not have any clinically detectable effects on the two dolphins. Geraci and St. Aubin (1982) also calculated the amount of fuel oil a cetacean would have to consume to be at risk based on critical doses established for rats. They determined the range of fuel oil (based on 5-25 ml/kg) necessary for fin whales to ingest would be between 200 to 1,000 liters. They concluded that it is unlikely that fin whales would ingest such quantities of crude oil since cetaceans do not drink sea water.

Interaction between feeding baleen whales and oil spills may result in oil fouling of the fine-bristle filaments on the baleen plates. Geraci and St. Aubin (1982) and Braithwaite et al. (1983) investigated the effects of oil on baleen filter-feeding efficiency. Geraci and St. Aubin reported a significant but transient decrease in water flow through sections of baleen, representing the baleen-filtering function in specimens of fin and gray whales. In flow-through experiments, Braithwaite et al. reported a 5.9- to 11.3-percent average reduction in filtration efficiency of bowhead whale baleen plates fouled with crude oil. The reduced filtration efficiency began to diminish noticeably after 8 hours but lingered and gradually diminished over 30 days (Braithwaite, 1981). Baleen whales that feed primarily on plankton crustaceans (krill) and possess baleen plates with long and fine-bristle filaments (such as bowhead, right, and blue whales) may be more sensitive to persistent oil adherence to the baleen and to interference with filter feeding than are baleen whales (such as the gray whale) that have baleen plates with short and coarse bristle filaments. Reduction of food sources from acute or chronic hydrocarbon pollution is a possible indirect effect of oil and gas activities. Most of the baleen whales of the North Pacific are seasonal feeders relying on the abundant food sources of the Gulf of Alaska, Bering Sea, and Arctic Ocean for nourishment, and living off stored blubber reserves while migrating and in their winter range. Significant reductions in food intake if they were to occur through decreases in the straining capacity of the baleen or through prey mortality could temporarily reduce energy acquisition by the affected whales during that season. This effect could reduce winter survival of highly stressed individuals and possibly could reduce the survival or fitness of calves born to affected females during the following spring.

It is unlikely, however, that whales would be adversely affected by changes in food resources, as they have various food habitats and are widely distributed in the lease area during their summer feeding period. Individual whales may experience indirect effects on a localized or temporary basis. Local, temporary contamination or chronic pollution that may result in reduced productivity of plankton or other important food items may stress endangered whale populations. However, this physiological stress that may occur to the whales, should oil spills interact with prey items, may be difficult to correlate with reductions in fecundity or migration fitness. Goodale et al. (1981) and Gruber (1981) reported sightings of whales and dolphins swimming and feeding in oil slicks.

The response of animals to acoustic stimuli has generally shown variance in behavioral and physiological effects, depending on species studied, characteristics of the stimuli (i.e., amplitude, frequency, pulsed or nonpulsed), season, ambient noise, previous exposure of the animal, physiological or reproductive state of the animal, and other factors.

Noise, including seismic exploration, may be the most likely by product of normal OCS industrial activities to affect whales significantly (Fraker et al., 1982). Noise-producing activities would include: air and vessel traffic, semisubmersibles, drillships, geophysical seismic exploration, and drilling platforms. The discussion of these activities and their effects on whales in the Final Supplemental EIS for Sale 70, St. George Basin (MMS,1983). The Acoustical Society of America (1980) also has estimated maximum source levels at 230 to 250 dB relative to 1 micro Pascal at 1 meter for various types of activities associated with seismic exploration. These are classified as the highest sound pressure levels associated with offshore oil and gas explorations--the pulses are of short duration (generally less than 1 second) and are generated intermittently for relatively short survey periods (on the order of a few months) in any given area (Gales, 1982). Seismic surveys also may be interrupted for a period of several hours or days.

Received-noise levels will be less than produced levels, and the rate of decay will depend on bottom absorption ability, the type of spreading (cylindrical or spherical), and other physical factors. Even with the maximum pressure levels estimated for seismic arrays at the sound source (230-250 dB re/micropascal), the sound pressure level is expected to be under 200 dB at distances beyond 100 yards (Gales, 1982).

Although little information is currently available on the sounds perceived by large whales (absolute hearing thresholds in baleen whales have not been measured), it is generally assumed that most animals can hear sounds similar to those that they produce (Gales, 1982). Fraker et al., (1982) indicates that bowhead whales are known to produce sounds at 175 to 185 dB relative to 1 micro Pascal at 1 meter and that right whales can produce sounds at 172 to 187 dB relative to 1 micro Pascal at 1 meter. Therefore, it is assumed that whales are able to perceive normal geophysical sounds associated with OCS activities.

Concern has been expressed by some cetacean researchers that, if the sound source is close enough and the intensity is loud enough, disturbance and displacement of whales, and perhaps some physical impairment of cetacean hearing, could occur (Braham et al., 1982). Possible adverse effects from loud sounds include: (1) auditory discomfort due to loudness/pressure changes; (2) possible hearing loss; (3) the potential masking of whale sounds such as might be used in intraspecies communications; and, (4) behavioral responses resulting in avoidance by whales of high ground areas.

It seems unlikely to expect adverse responses to very high-pressure-noise disturbances in animals which are adapted to life in the sea, where pressure changes on the order of many atmospheres in magnitude are routinely experienced in ocean margin earthquakes (Northrop, 1972) or in diving. Also, some animal, such as cetaceans, routinely breach or jump free of the surface and return with a diving splash that creates a sudden large increase in pressure.

Hearing damage is a cumulative process, requiring a combination of high sound level and extended periods of exposure. The damage process involves a "fatigue" of the auditory sensory nerves. These nerves are able to recover partially during periods of quiet; thus, the time sequence of exposure is important. A continuous exposure is generally more serious than an interrupted one, the latter giving intermittent periods of recovery.

Acoustical studies and observations at offshore at offshore oil and gas platforms in Cook Inlet, Alaska, and Santa Barbara, California (Gales, 1982), indicated that platform noise was unlikely to interfere with cetacean echolocation and was expected to interfere with certain other acoustic communication in signals only very close to a platform. Observations indicated that whales either ignored or easily avoided platforms, without an appreciable change in behavior.

The degree of behavioral response by endangered whales to sounds associated with oil and gas exploration and development has been investigated for several species. Potential acoustic responses may result from several noise-producing activities such as drilling platforms, drillships, semisubmersibles, and air and vessel traffic. The level of effects on endangered species may range from very low to moderate, depending on the species and the population's well-being. It is anticipated that the level of seismic activity associated with a lease sale area would depend upon the number of exploratory/delineation wells and production platforms installed.

The gray whale migration was studied and experiments were conducted using both a single airgun and an airgun array (Malme et al., 1983, 1984). The course deflections of whales in response to seismic noise from a 100 cu. in. airgun and a 40-gun array of airguns (4,000 cu. in.) were measured using theodolites. Results showed an 0.8 probability of avoidance to seismic noise at 180 dB. There was 0.5 probability of avoidance to the single airgun (100 cu. in.) at a distance of 400 meters and to the airgun array at 2.5 km. Avoidance behavior to the full array began to occur (0.1 probability of avoidance) at 5 km.

Reactions of cow/calf pairs were tested separately. No responses by these maternal pairs (April/May experiments) were noted during line runs of seismic airgun arrays at distances of 5 to 83 kilometers. When a moving array of larger airguns was turned on suddenly within 1 kilometer of cow/calf pairs, responses were dramatic. The whale groups were seen to change direction (orienting south), to exhibit confused swimming, to move inshore into the surf zone, and to mill about for varying lengths of time--often followed by rapid swimming to avoid the source area. On four occasions, whales were observed moving into the surf zone and within the sound shadow of a nearshore rock or outcropping. Such a dramatic effect was felt to represent a "startle response," rather than a typical response to increasing sound levels. The distance at which these groups resumed normal migration ranged between 3.6 and 4.5 kilometers.

Whales exposed to drilling-platform, helicopter, and production-platform stimuli also showed avoidance responses in which migration track lines were deflected away from the source of the playback stimulus (Malme et al., 1983, 1984). A 0.8 probability of avoidance to these pre-recorded sounds was noted at a received sound level of 130 dB. There was a 0.5 probability of avoidance by migrating gray whales at 1,100 meters to playbacks of drillship noise. Other recorded sounds showed similar avoidance only at distances less than 100 meters.

A recent task force report on Geophysical Operations (1982) submitted to the executive officer of the California State Lands Commission determined that no evidence was found to suggest that airguns and other nonexplosive acoustic sources cause injury to marine mammals, including gray whales. As stated in the task force report, National Marine Fisheries Service (NMFS) believes that "sufficient information is available in the literature to conclude that geophysical exploration does not result in physical harm or mortality of marine mammals in the vicinity of operations."

Additionally, this report determined that geophysical exploration off the California coast does not constitute "harassment" of migrating gray whales, as defined under the Endangered Species Act. The NMFS determination also may apply here, since gray whales, when in the North Aleutian Basin, are primarily in a migratory mode.

The right whales are the closest living relatives of the bowhead whales. The right whale's appearance and behavioral repertoire are very similar to those of the bowhead whale (Wursig, personal communication). The similarities in behavior between the bowheads and right whales have been described by researchers familiar with both species (Wursig et al., 1982). Therefore, since the effects of geophysical seismic activities and oil-spill contact have been observed on bowhead whales, but not on right whales, the knowledge gained from these observations of bowhead whales can be extrapolated to effects on the right whale.

The majority of bowhead vocalizations center around 200 Hz but some vocalizations extend perhaps as high as 6 kHz (Ljungblad et al., 1980). Norris and Leatherwood (1981) predicted an upper hearing threshold of approximately 12 kHz for bowhead whales. All offshore drilling produces underwater noise mainly below 1,000 Hz (Richardson et al., 1983).

Observations of bowheads from 1980-83 near island construction and active dredges indicate that some bowheads occasionally tolerate noise levels associated with these activities (Richardson et al., 1984).

Bowheads seem more sensitive to aircraft than are other species of whales, but sensitivity to aircraft varies with season, whale activity, and water depth (Richardson et al., 1984). Bowheads engaged in socializing appear less sensitive to aircraft than are bowheads engaged in other activities. Reactions to the observation aircraft were conspicuous when it was below 457 meters above sea level, occasionally at 457 meters, and seldom at 610 meters.

Reactions to boats were stronger than to any other type. Experiments with bowheads indicate that they react strongly to close approaching vessels of any size. Reactions began when boats were as far away as 4 km; by 2 km traveling away from the approaching vessel was more pronounced. Other behaviors consisted of changes in surfacing and respiration patterns and increased spacing within grouped whales. However, the flight response did not persist for long after the boat had moved away. The scattering of grouped bowheads continued longer than the flight reaction which indicated that some degree of social disruption occurred.

Bowheads have been observed within 4 to 20 km of drillships in the Canadian Beaufort Sea. The whales' activities appeared to be characteristic of undisturbed whales, although a few exceptions occurred. Playback experiments (received levels of 100-113 dB) showed that some bowheads reacted to drillship noise at intensities similar to those that would be found several kilometers from a real drillship, although not strongly.

Fraker et al. (1981) observed a group of seven bowheads within 13 km of a seismic exploration vessel, and they showed no obvious disturbance of behavior, Surface times, intervals between blows, and blows per surfacing were normal. The sound level at the whale's location was stated to be at least 135 dB relative to 1 micro Pascal, and possibly as high as 146 dB. On eight occasions in 1980 to 1982, Richardson et al. (1983) observed bowhead behavior in the Canadian Beaufort Sea in the presence of noise from seismic operations. The source level was 248 dB, and the received noise levels at 6 to 8 km were approximately 141 to 150 dB, respectively. There was no clear evidence that these whales attempted to move away from the seismic ships. The bowheads generally continued to produce their usual types of calls in the presence of distant seismic sounds, and they did not swim away from seismic vessels operating 6 km or more away. Reeves and Ljungblad (1983) observed bowheads on 14 geophysical-monitoring-survey flights in the Alaskan Beaufort Sea. Whales seen as little as 9 km from active geophysical operations were not observed to vacate the area or to display avoidance behavior. Observations of bowheads, 6 to 99 km away from active seismic vessels, showed them engaged in normal activities (received levels 158 dB relative to 1 micro Pascal).

Although specific behavior in the presence and absence of seismic noise may be variable, the above data suggest that bowhead whales (and possibly right whales) are generally tolerant of geophysical seismic noise, at least in ranges of 6 to 8 kilometers, but show avoidance behaviors at ranges of less than 5 km.

Humpback whales are sometimes thought to be more sensitive to noise and other disturbance factors than other endangered whales. The NMFS biological opinion (Leitzell, 1979) concluded that "Uncontrolled increases of vessel traffic, particularly of erratically traveling charter/pleasure craft, probably has altered the behavior of humpback whales in Glacier Bay, and thus may be implicated in their departure from the Bay the past two years." However, other factors also may have affected humpback use of the bay. Baker et al. (1982) and Miles and Malme (1983) indicated that humpback whales in Glacier Bay showed markedly different behaviors in response to approaching boats. The most frequently observed behavior was an increase in aerial behaviors as the boats got closer to the whales. Evidence of humpback sensitivity to disturbance has been reported in their wintering grounds (Norris and Reeves, 1978), although Payne (1978) listed numerous instances of apparent insensitivity of humpback whales to noise. Feeding humpback whales studied in the fall of 1984 in southeast Alaska (Malme et al. 1985) showed little or no short-term avoidance to industrial sounds at the sound levels received (up to 172 dB). This may indicate a general insensitivity to oil industry noise by humpbacks or it may be an indication that feeding whales will tolerate more acoustic disturbance than migrating ones.

Geraci and St. Aubin (1982) reported that fin whale baleen plates showed conclusive evidence that crude oil temporarily reduced filtering efficiencies but that normal flow patterns were restored after 15 minutes. Since all the Balaenoptera whales prefer euphausiids and copepods as their primary prey, oil-spill effects on the whales would be more indirect by locally eliminating prey which would be killed by the toxic components of an oil spill. Although no direct testing of effects due to seismic activity has occurred for the blue, sei, or fin whale, it is anticipated that reactions would be similar to those of gray and bowhead whales. Fin whales feed in the upper portions of the water column and therefore may be exposed more frequently to seismic noises than whales which feed deeper in the water column.

Sperm whales feed at great depths and lack baleen (present in mysticete whales), which can become fouled upon contact with spilled oil. Their deep-feeding habitats mainly preclude oil ingestion since oil contaminated surface waters would not normally be contacted during the feeding process. Sperm whales use their acoustical system, which generally operates at high frequencies (1-100 kHz), to echolocate and communicate. Because they operate at high frequencies of shorter wavelengths, the acoustical receiving and transmitting system of sperm whales tends to be directional and is capable of discriminating against unwanted sounds. It does not appear that any serious interference with their communication is likely, especially since the more powerful geophysical seismic noises are produced at low frequencies. Sperm whales have been observed in day-long proximity (200 yards - 1.5 nm) to an operational drillship indicating a lack of aversion to drilling sounds (Pers. comm. Tony Ladino, MMS).

A formal Section 7, Endangered Species Consultation of MMS with NFMS and the FWS was conducted for the Proposed Sale 88, Gulf of Alaska, Cook Inlet planning areas. The biological opinion from the FWS was dated August 29, 1983, and covered the peregrine falcon. The biological opinion from NMFS is dated January 13, 1984, and covered North Pacific right whales and gray whales. See Chapter V for further description of the Consultation process for Section 7 of the Endangered Species Act of 1973.

Because of broad distributions of whale species in the Gulf of Alaska planning area, seasonal utilization of specific areas, relatively low population levels potentially affected (for all species except gray whales), low probability of oil spills, (37%) and the vast size of the Gulf of Alaska planning area, it is very unlikely that the one projected spill of 1,000 barrels or more of oil would come in contact with a large proportion of any endangered species. While it is possible that some endangered whales might encounter an oil spill, it is very unlikely that such interaction, if it occurred, would significantly affect these animals. Oil spills can be considered unlikely to have (1) significant effects on endangered whale populations and (2) significant indirect, food-chain-related effects on endangered whales.

Noise associated with oil and gas exploration (12 wells over 4 years) and development (1 platform) is unlikely to significantly affect populations of endangered whales. Acoustic interaction, if it occurred, would be localized and cetacean responses would be short-term. These short-term responses are not expected to preclude a successful gray whale migration or to disrupt the feeding of humpback and other endangered whale species.

CONCLUSION: The potential effects on endangered whale species are expected to be low.

CUMULATIVE IMPACTS: Factors which may produce cumulative effects on endangered whales include those projects listed in Section IV.A.2; proposed or future State and Federal offshore oil and gas lease sales, and other nonpetroleum industry sources of oil spills and disturbance.

Certainly of concern is the cumulative effect of oil spills (an increase to 10 spills over 35 years) and other pollution associated with the projects described in Section IV.A. Cumulative effects might increase if all the potential developments took place, especially for feeding humpbacks and the seasonal migrations of the gray whale population. As suggested previously, the long-term, ecosystem-wide, cumulative effects of chronic pollution will be of concern, since changes in total ecosystem productivity are a possibility.

If the proposal yields discoveries of oil and gas (production activities, resultant increases in human activity, increased localized or shipping corridor disturbance, and increase pollution), then cumulative effects from noise disturbance could potentially affect endangered cetaceans, although habituation to acoustical disturbance is a distinct possibility.

Available information (Malme et al. 1984) indicates that migrating gray whales display a high degree of tolerance to geophysical seismic noise. A review of historical data from oil companies and geophysical companies of their own seismic surveying did not reveal any demonstrable long-term effects on gray whale migration routes or population growth. Between 1967 and 1979, when seismic activity was increasing exponentially, gray whale population growth increased at a rate of 2.5 percent each year. This showed that although minor localized course alterations or avoidance reactions can occur, major long-term effects on migration routes or population levels are extremely unlikely for the sound sources tested.

Less is known about possible cumulative effects of noise on other endangered whales, however the observed short-term acoustic responses by such species as feeding humpback and sperm whales indicate a potential insensitivity to oil and gas industry noise.

CONCLUSION: The potential for cumulative oil spill and noise-disturbance effects on endangered cetaceans would be no greater than moderate.

Endangered and Threatened Birds: An oil spill or blowout would probably have a low effect on the short-tailed albatrosses (DeGange, 1981). This is more a result of a small population being dispersed over a vast marine range than any other factor. With increased exploratory activity in other Alaskan planning areas within the range of the albatross, cumulative effects could occur.

The Aleutian Canada goose has not been reported to the Gulf of Alaska planning area. The known nesting areas and migration route of the Aleutian Canada goose make it unlikely to be affected by oil spills.

The migratory route of the endangered and threatened peregrine falcons (*Falco peregrinus tundrius* and *Falco peregrinus anatum*) brings them near the Yakutat portion of the planning area during the spring and fall migrations. Since peregrines would only be exposed during the brief migratory period and their preferred prey are ducks, it is unlikely that migrating peregrine falcons in this area would be affected by oil spills. (Considering the very large planning area and the low number of oil- spills- e.g., one offshore spill is estimated- only a few birds could be affected).

It is unlikely that oil spills and noise disturbance would significantly interact with or affect the endangered Aleutian Canada goose, the short-tailed albatross, and/or the peregrine falcon.

CONCLUSION: Effects on the endangered bird species are expected to be very low in the Gulf of Alaska planning area.

CUMULATIVE IMPACTS: One sale with 63 exploration wells and 200 development wells from 5 platforms with the 99% probability of 1 or more spills of 1,000 barrels or more in the Gulf of Alaska is not expected to contribute significantly to cumulative factors which may affect endangered and threatened birds. This is due to the vast size of the planning area and very low numbers of the endangered bird species distributed over their extensive ranges.

CONCLUSION: Effects on endangered and threatened birds would be very low.

(f) Impact on Estuaries and Wetlands

These topics are discussed and impacts analyzed where they occur as habitat for the fish and wildlife species in (4)(a) through (4)(f) in this section.

(g) Impact on Areas of Special Concern

These areas are all habitat for the fish and wildlife species in (4)(a) through (4)(f) and impacts are discussed as they occur in the planning areas.

(h) Impacts on Marine Sanctuaries

There are no marine sanctuaries in the Alaska OCS Region.

(5) Socioeconomic Environment:

(a) Impact on Employment and Demographic Conditions:

As referenced under section III.C., although the economic forces in the state have been large and positive, unemployment in the area has remained high. The reason for this high unemployment is due to the large influx of nonresidents to the area and that many of the jobs are seasonal, including employment in construction, fishing and fish processing, recreation and tourism, and mining. Peak unemployment normally occurs during the winter months.

Government, including Federal, State, and local, is the largest employment section in the state. Many of the jobs in the various employment sectors within the state and in the Gulf of Alaska planning area are directly or indirectly attributable to the exploration, development, processing, and transportation of oil and gas in the state.

The search for and discovery of oil and gas within the Gulf of Alaska planning area could create employment opportunities and consequently increase population levels. These changes have both positive and negative attributes, thereby giving an indication of the socioeconomic well being of communities the state or regions within the state.

This proposal could generate a region with total of about 420 jobs during peak activity. This is based on estimates made in past EIS's for the Alaska OCS Region for similar activities in similar areas. The bulk of the job (perhaps 90%) will be filled by workers living in enclaves near the job site.

The general pattern is one of small employment effects in the exploration phase and fairly large effects during the development phase (starting in 1990) with most jobs in both the exploration and development phases filled by commuters living in the petroleum industry enclave. By contrast, it is expected that the moderate number of new jobs created during the production phase (starting in 1998) would be filled somewhat by permanent residents of a community.

A State wide peak population increase of about 780 persons could associated with the projected employment increase. Of that number a small proportion may live in a small town or village associated with development activity. The bulk of the new population (family's of enclave living workers) could live in Anchorage, the Matanuska Valley or on the Kenai Peninsula.

Impacts are potentially more significant in those areas of small present population near which offshore-related activities may be located.

For the Gulf of Alaska planning area Yakatat, Seward, or Cordova are the towns that may be affected. Because of the small number of new jobs and population anticipated, impacts are expected to be low on a regional basis. Impacts at any one of the named villages could be moderate during an influx of population depending on timing and duration.

CONCLUSION: The regional impacts to employment and population as a result of the proposal are low. Impacts at the village level could be moderate.

CUMULATIVE IMPACTS: Projects and programs included in the cumulative impact analysis are listed in 11.A.2.

Cumulative effects of Federal oil and gas development in the Gulf of Alaska Region plus the State generated activities could substantially increase regional employment and populations. Because of the size of Alaskan planning areas and the wide distances between coastal villages, local employment and population growth will more nearly follow estimated employment and population growth figures for the planning area rather than experience much growth for a cumulative basis. Because of the staggered schedule of activities employment figures are not additive because some of the workers will work and several projects.

CONCLUSION: Cumulative employment and subsequent population growth will be moderate both regionally and at the local level.

(b) Impacts on Coastal Land Uses:

The search for and discovery of oil and gas in the Gulf of Alaska planning area will affect coastal land uses. There will be direct demands for land needed to support the effort to explore, develop, produce, and transport hydrocarbon reserves if discovered. There will also be secondary demands for land from the induced population. It is assumed that the majority of activities in the exploration and development of hydrocarbons will occur in the private land market and will be primarily concerned with the mix of commercial, industrial, and residential land.

At the Federal, State, and regional level, the absolute ownership changes will be small. However, it is possible that demands for the land to satisfy production and transshipment could occur on these lands.

At the community level the ownership changes during the exploration stage could be significant, especially in the relative sense. The village nearest the development or the one being used for support and supply could experience large ownership change. In the Gulf of Alaska planning area Seward and Kakatat are the villages most likely affected.

Small absolute changes in the ownership patterns of key community services or areas could be large in the communities' view (oil and gas concerns buying or leasing land and capital improvements to support their activities). Induced populations could increase demands and changes in land ownership, especially in residential area demands for space. If these ownership changes take place, they will, however, diversify the economic base of a preponderantly fishing economy and increase the tax base of the community.

Impact from siting facilities will be both long- and short-term, depending on the activity involved. Onshore pipeline construction will be a short-term impact. Blasting, trenching, vehicle emission, earth removal, etc., will result in short-term disruption of the terrain, vegetation, and wildlife. There are also conflicts caused by the temporary presence of noise, odor, and visual degradations. After emplacement, the earth removed in the operation will be replaced. It is assumed that vegetation will reestablish itself and that the construction site will assume a near normal appearance.

Development and use support facilities would have a long-term (35 years) impact on land use. By supporting facilities is meant a wide variety of supply and service industries having capabilities to support the exploration, production, and transportation of gas and oil. An operating base of support provides facilities for air and marine transportation, office and warehouse space, maintenance, and radio equipment. The increased vessel and air traffic into these areas will exert pressures on existing airfields and docking facilities.

In addition to the direct demands for land resulting from offshore production in the Gulf of Alaska certain secondary effects would result. As induced population moves into existing or new communities, they will create a demand for residential; commercial; public; and quasi-public and open space lands. These demands may encroach on existing land configurations and, in some cases, require extensive changes in land use patterns. As previous discussions have inferred, the preponderant demand for land for both housing and supportive services, will center in the Anchorage Matanuska Valley and Kenai Peninsula areas. However, even a small demand for new dwellings and secondary services located in the smaller communities could have a large relative impact to existing land patterns within these areas.

In the Gulf of Alaska planning area it is expected that 1 marine support and supply base will be needed and 1 air support base. Then could be 1 or 2 onshore pipeline land fills and 1 oil and gas shipping terminal. Location of these facilities cannot be absolutely identified at this time.

CONCLUSION: Regional impacts would be low.

CUMULATIVE IMPACTS: The proposed action is not expected to constitute a significant portion of the region's overall effects from developmental activities. Adequate industrial and residential lands are available to accommodate growth expected for the proposal. Anticipated industrial sites are far removed from each other and these would spread the impacts on land use over several regions. This would have the effect of spreading out cumulative effects over the Gulf of Alaska region as a whole but localizing them on a planning area basis.

CONCLUSION: Cumulative effects are expected to be low.

(c) Impact on Commercial Fisheries:

The commercial fisheries of the Gulf of Alaska area are of three political-economic designations: (1) domestic, (2) foreign, and (3) joint-venture. Together these operations harvested (1980), 8.2 percent of the total fish catch from all U.S. waters. The Gulf of Alaska (includes Gulf of AK. Cook Inlet, Kodiak and Shumagin Planning areas) accounted for 40 percent of the total Alaska catch by U.S. fishermen and about 15 percent of the foreign fleets Alaskan waters catch.

Oil exploration and development in the region, including seismic surveys, could affect the commercial fisheries in the following ways: (1) oil spills could damage the fisheries resources; (2) fishing gear could be lost or damaged, and there would be related lost fishing time; (3) and there could be displacement from fishing areas and possibly from harbors or other onshore space.

Oil-spill effects on all commercial species are expected to be very low (Refer to Section IV.A.(4)(a). This is because only 1 spill over 1,000 barrels is projected over the 35 year life of the field; the low probabilities of spills occurring when vulnerable early life stages are present; the low probabilities (37%) that a spill would occur; and the generally low concentrations of dissolved hydrocarbons expected to be associated with a marine oil spill. Therefore, effects on the commercial fishing industry as a result of direct harvest losses due to oilspill mortality are also expected to be very low.

The fishing gear loss problem is primarily during the exploratory phase, in that seismic vessels and fishing gear try to occupy the same space, many times to the detriment of both industries. The crab fishing industry is most affected because crab pot float lines could be cut or tangled in seismic gear and fishermen then could lose the pots and the crab contained in them.

In early summer 1983, representatives of both industries met to resolve this and other oil/fishermen problems. The result has been a "Manual for Geophysical Operations in Fishing Areas of Alaska" developed by a committee formed from personnel of both industries. A standing committee has been formed to maintain working contact and update the manual. This should go far in resolving effects assessed to this activity.

Gulf of Alaska areas are expected to have lesser effects on commercial fishing due to fishing areas being somewhat divorced from oil activities and the small number of these activities. Twelve exploration wells are expected to be drilled over 4 years and only 1 production platform is envisioned.
The potential effects of oil spills on the commerical fishing industry are difficult to quantify because of the several variables involved; not the least of these is the seasonal and often transient nature of the fisheries. Thus, it is possible for an oil spill to impinge on a fishing area or areas. However, low number of estimated spills (one) plus the relatively limited fishing area subject to contact, and the usual limited fishing periods and seasons indicate a low level of impact.

Gulf of Alaska fishing areas could be affected by oil development, principally through large oil spills of some duration polluting critical nearshore fisheries habitat and more so, during the early pelagic life (egg and larval) stages. However, the analysis in Section IV.D.1(4)(b) concludes that there would be only very low effects on populations supporting commercial fisheries.

Commercial fishing might also be adversely affected by oil spills fouling fishing gear and/or flavor/tainting its catch and concurrent lost fishing time. The fishing industry could be compensated for these losses through the provisions of the Offshore Oil Pollution Compensation Fund (33 CFR, Parts 135135). A self-replenishing fund of $100,000 for each OCS area has been established; however, claims are not limited to this amount. Regulations now in effect have reduced the former overly long claim-processing time. For details regarding this fund, see Alaska OCS Technical Paper NO. 4 (Casey, 1981).

Lost fishing time in the Gulf of Alaska may result from the time required to replace or clean and repair oil-fouled gear. Lost fishing area could result from placement of structures, including pipelines, in fishing areas especially where trawl fleets operate, and oil development might also interfere with fishing vessel traffic. There is however only 1 production platform and 2 pipeline estimated for the Gulf of Alaska.

To date, on and offshore construction projects related to offshore oil and gas exploration and development in the Cook Inlet region have had minor effect on the fishing industry. The workforce for oil and gas development has largely come from outside the fishing industry, and this is expected to continue so long as income derived from fishing remains at current levels.

Secondary effects on the fishing industry would be loss of fixed gear and crab pots as a result of oil industry marine traffic. The recent formation of an Oil/Fisherman Group will go far in reducing these effects.

Loss of fishing area through the presence of offshore platforms and pipelines is assessed as low. If it is assumed that one of three exploratory rigs would be operating in the Gulf of Alaska (12 exploratory wells over 4 years) and that an exploratory platform preempted a 1,000-meter radius around the platform from any fishing activity, then approximately 1.9 square kilometers (maximum) would be preempted at any one time in the entire planning area during exploration. If the same assumption is used for the one development platform assumed in the Gulf of Alaska, then approximately the same square kilometers would be preempted. If trawlers avoided pipelines using a 500-meter buffer on either side of the pipeline, then about 150 square kilometers would be lost to fishing. Therefore, the total area that could be lost to trawling for pelagic and demersal fish (groundfish) would be 1.9 square kilometers during exploration and 156.3 square kilometers for development and production. Since this represents a small area relative to the large area used by both foreign and domestic trawlers in this region, only low effect to commercial fishermen is expected, even if harvest losses were conservatively estimated as being proportionate to the total area preempted.

The gear loss problem may be solved by space allocation of fairways for oil industry vessels, including tankers. This has already been done for Alyeska Pipeline oil-tanker traffic in Prince William Sound. In addition, a recent "Manual for Geophysical Operations in Fishing Areas in Alaska," prepared by a joint fishing industry/oil industry group, could help alleviate potential conflicts.

Oil development, by bringing more air and vessel traffic into the area, will provide safety and other benefits to fishermen in the form of better communications, increased air-sea rescue capabilities, and more commercial amenities in port communities. At the same time, increased air and vessel traffic may decrease safety by increasing the probability of vessel collisions, to an in determinate degree. At present, most vessel collisions occur in restricted areas (bays and harbors) during times of limited visibility. The incidence is very low, and the oil-vessel increment should not appreciably increase this already low rate. Analysis of the potential for collisions by Centaur Associates, Inc., under contract to the Minerals Management Service, indicates a collision rate in the open ocean, in ports, and in transit of less than one per year for 20 years for all areas of Bering Sea oil and gas development. (Bering Sea Commercial Fishing Impact Analysis, Alaska OCS Social and Economic Studies Program Draft, Centaur Associates, Inc., 1983.)

CONCLUSION: Effects on commercial fisheries from the proposed action are estimated to be low.

CUMULATIVE IMPACTS: Other Federal lease sales off the Alaskan coast, primarily in the Bering Sea, could increase effects on the fishing industry in the Gulf of Alaska. The principal effect would result from an unknown amount of tanker traffic from these areas in transit through this lease area. State oil and gas lease sales in upper Cook Inlet would maintain the present rate of tanker traffic through the area for a longer (up to 20 plus years) time. Additional discoveries of oil from the Prudhoe Bay/Beaufort Sea area would maintain present tanker traffic levels from Valdez through the area for many years.

In the southern portion of the planning area, developing fisheries for new species (abalone, squid, and octopus) may result in as yet unforeseen conflicts from oil and gas development.

Vessel traffic other than oil- and gas-related transport is projected to increase in the lease area as the population of Alaska increases--another cumulative cause. The effect of these continuing or increasing transportation efforts could be increased conflicts between fishing vessels and other ships and could affect docking, harbor, and supply needs.

CONCLUSION: The cumulative effect on the regional commercial fishing industry is expected to remain low.

(d) Impact on Recreation and Tourism:

Most effects on recreation and tourism would be changes in numbers of users, property values, and visual qualities. There is expected to be a small population increase (780 people) due to proposed exploration and development activities. This increase in users of recreational resources would not place serious stress on the visual qualitites and property values in a local area for any long period of time. Visual qualities would be changed in this pristine area by the appearance of one oil platform if it is within the 12-mile zone of a recreational area. A gas flare at night would also be visible at such distances. These changes in visual quality would be local and would extend only for short periods of high activity (such as drilling and pipelaying) over the duration of the lease.

The Gulf of Alaska planning area is expected to produce 113 million barrels of oil and 1751 billion cubic feet of gas. The probability of hydrocarbons is 0.08. Based on these figures one spill greater than 1,000 barrels is expected to occur during the lease period.

The recreation and tourism resources involved are above the mean on only one of three factors (barrels of oil equivalent, marginal probability and percent of total Alaskan tourists visiting the area.

It is unlikely that there would be partial closure of some public water-oriented recreational facilities for a short period at any time of the year. There could be some lowering of the quality of resources.

CONCLUSION: Effects on recreation and tourism would be low.

CUMULATIVE IMPACTS: Effects on recreation and tourism are caused by increased population and access caused by Federal and State oil and gas leasing activities, other projects that may take place and the increased emphasis placed by the State on tourism. The sheer size of the Gulf of Alaska region, its present sparse population and access and the very low level of proposed development will tend to keep cumulative impacts low.

CONCLUSION: The cumulative impacts are expected to be low.

(e) Impacts on Archaeological Resources

Effects on archaeological resources could result from disturbance to underwater landforms, shipwrecks, and historic sites. Onshore prehistoric and historic sites may be affected by increases in industrial populations which in visiting the site accidently disturb it. Effects are similar although of less magnitude than those given in the Sale 88 FEIS (USDOI, MMS, 1984). Four onshore historic sites are especially important and could be affected moderately. Given the small number of offshore blocks on which habitable landforms have survived, there is a small chance of effect offshore. A number of shipwrecks exist in the area. However, the chance of survival is low except in bays, and very deep water. The effect on these could be moderate if interaction occurs between the site and oil and gas development activities. The probability, however, of interaction between oil and gas development and shipwrecks is low.

The Gulf of Alaska lease area is expected to produce 113 million bbls of oil and 1751 billion cubic feet of gas. The probability of hydrocarbons is 0.08. Based on these figures, one spill greater than barrels is expected to occur. It is also expected that only 1 production platform and perhaps 2 pipelines will be associated with the proposal.

Analysis reveals unique archaeological or historical resources exist within the area and may be disturbed, resulting in minimal loss of data; there are also nonunique archaeological or historical resources which may be contacted or disturbed, resulting in loss of data which may be equally obtainable from other sources.

CONCLUSION: The effect to archaeological resources in the planning area are low.

CUMULATIVE IMPACTS: The major actions affecting archaeological resources are the activities associated with federal and state oil and gas lease sales. The cumulative effects of other private, state and federal projects, together with the proposal, result in an unlikely chance of interaction with archaeological resources.

CONCLUSION: Cumulative effects on archaeological resources in the planning area are low.

(i) Impact on Transportation Systems

Peak transportation activities are expected to occur in 7-8 years. In this period, pipeline and terminal-construction activities, (if necessary) as well as vessel movements, should reach their apex. In the subject time frame, support-boat round trips could be expected to reach 30-40 per month. Of that total, most round trips would leave from Yakutat, with perhaps some (3-4) from Seward.

In addition, barge traffic could be expected at the terminal site.

Apart from development-phase traffic whenever they occur, the present facilities in Gulf of Alaska area should easily be able to handle support requirements in all phases of offshore operations.

In regard to the terminal site, the activities generated by the proposal could result in new or additional dock and wharf construction.

In terms of regional traffic densities, tanker traffic generated by the proposal action is also expected to be negligible. Using a 100,000-DWT (dead-weight tonnage) oil tanker as a standard, it could be expected that terminals would service a tanker every 24 days.

Air traffic, like marine-vessel movements, is expected to reach maximum intensity in the year 1998. For all airfields in the Gulf of Alaska area, the principal effect of this proposal would be a rise in the number of enplaned passengers and perhaps the construction of new facilities. The effect of proposal-generated drilling and construction activities on total aircraft operations would be very low for all analyzed airfields except the chosen support and supply rise. In the case of facility, peak air operations due to development operations would constitute 1-3 percent of traffic.

Increased passenger emplacement could require a refurbishing and/or upgrading of passenger facilities at all affected airfields. Significant (but short-term) effects could be expected to accrue to the marine and air facilities. These impacts should occur primarily during the seventh and eighth years of the lease sale.

CONCLUSION: Considered on a regional basis, the effect of the proposal could be considered low.

CUMULATIVE IMPACTS: In time, the minor increase in air activity which may be caused by the proposal will be lost in the general increase in air traffic which is forecast to occur for most of the Gulf of Alaska region. In regard to tanker traffic, the proposed action would have a very low effect on large-ship traffic transiting the gulf because of the small amount of projected oil and gas resources in the region. In addition, the cumulative effects of other private, state, and federal projects, together with the proposal, is expected to result in an overall low increase in cumulative impacts.

CONCLUSION: Cumulative effects of transportation systems in the planning area are anticipated to be low.

(g) Impact on Military Uses

This is not a subject discussed in the Alaska OCS Region as there are no restricted military areas.

(h) Impact on Subsistence-Use Patterns:

The proposal can affect subsistence-use patterns in three general ways: 1) disturbance of subsistence resources, 2) interference with subsistence harvesting activities, and 3) increased competition for subsistence resources. These concerns relate to Section 810 of ANILCA. Although that section does not apply to the 5-year program stage of the OCS program it does provide a useful method of analyzing the environmental effects of future OCS activities on subsistence use patterns. These are further described below in a generic fashion. The discussion pertains to subsistence-use impacts in all Alaskan planning areas and is to be used as a reference for the area specific discussions in following planning areas.

The biological effects discussion for this planning area describes how and the degree to which the proposal could disturb biological resources, some of which are used for subsistence. The primary means by which resources are disturbed are noise; pollution, including oil spills; and through the construction and siting of offshore and onshore support facilities. In general, the intensity of offshore disturbances diminishes before reaching nearshore subsistence resources. While an oil spill is probably the most acute damaging agent, it is also the least likely to occur (one projected). In addition to direct effects on fish and wildlife populations, until the extent of a disturbance threat to a population was ascertained, a reduction or closure of harvests could occur.

Disturbance effects on subsistence resources could occur at two levels of severity, 1) more likely lower level effects which alter the normal distribution patterns, thereby possibly making them more difficult and expensive to harvest, and 2) less likely higher level effects which reduce the population directly or reduce the number of those fit for human consumption for a specific period of time, either of which would reduce or eliminate desired harvest levels. One characteristic of subsistence activities which may alter the level of effects is their high degree of seasonality. If a disturbance occurs right before or during a limited subsistence harvesting period, the effect on subsistence could be exacerbated. If a disturbance occurs outside of the limited harvesting period, the effect could be reduced.

The discussions of the effects on commercial fishing for all but the most northerly planning areas, Hope, Chukchi, and Beaufort Sea, cover many of the disturbance effects on commercial marine resources that are also used for subsistence. While subsistence harvesting relies on more nearshore resources and is more diversified and different in many respects from commercial harvesting, several of the types of effects on the overlapping sets of resources that could occur are similar. Due to the interrelationships between commercial fishing and subsistence activities, such as using cash income from commercial fishing to purchase supplies or equipment to support subsistence, adverse effects on commercial resources can also indirectly affect subsistence.

The discussion of the effects on commercial fishing for each planning area covers many of the possible interference effects on the harvesting of commercial marine resources that also apply to subsistence. The means by which subsistence activities are interfered with include: limiting or excluding access to certain areas, noise that causes game to flee or become wary, fouling or damaging of gear or equipment, increased probability of vessel collisions, and competition for services, materials, and equipment. Subsistence activities are generally more concentrated in nearshore areas, such as beaches, lagoons, and wetlands which tends to reduce the probability or degree of adverse effects because many of the activities resulting from the proposal will occur further offshore than subsistence activities. Exceptions to this occur in areas where walrus are taken far from shore, (such as, St. Lawrence Island). Construction and siting of onshore facilities may affect subsistence harvesting of terrestial resources. This may become particularly important if a major facility such as a pipeline is constructed. Benefits to subsistence activities that may result from the proposal include more commercial amenities in port communities and increased safety from improved communication, increased air-sea rescue capabilities and better access.

The other socioeconomic effects discussions for each planning area cover the number of new residents, workers living in enclaves, and commuters expected in an area due to the proposal and many of the possible effects that may result. New residents and enclave residents could be considered as possible competitors with the existing residents, either directly by participating in subsistence activities themselves or indirectly through sport hunting and fishing. Improved access to harvest areas for both local and non local people may also increase subsistence and sport harvest competition. The results of added pressure on subsistence resources (such as shorter seasons, catch limitations, and reduction of close-in, easily accessible resources) could increase and induce additional hardship on long-term subsistance uses. Subsistence effects in one planning area may spill over into adjacent planning areas if the affected users travel beyond their traditional-use areas in search of better harvest opportunities.

The primary potential effects on subsistence are possible reductions in desired harvest levels or increases in time and effort to achieve desired harvest levels. These possible effects in each planning area will be determined by: level of activity as a result of the proposal, subsistence resources affected and their susceptibility, species harvested, harvest time and techniques, and degree of dependence on subsistence resources. As discussed in the subsistence-use pattern sections for each planning area in Chapter III, The Affected Environment, subsistence resources and uses vary considerably among planning areas. For example, generally subsistence users heavily dependent on marine resources will probably be affected much differently than those more dependent on terrestial resources. If subsistence harvests are reduced or lost, particularly those that are heavily relied upon or are relatively inexpensive to harvest, they will require replacement by other subsistence resources or by scarce cash (in general, opportunities to earn cash in rural areas are very limited). In general, subsistence resources and uses nearest air/marine support bases, pipeline landfalls, terminal sites, and tankering routes will be most susceptible to adverse effects.

The following discussion (of the Gulf of Alaska planning area) summarizes the discussion of subsistence effects from the Eastern Gulf of Alaska (Sale 55) FEIS (USDOI, MMS, 1980) and sociocultural effects from the Gulf of Alaska/Cook Inlet (Sale 88) FEIS (USDOI, MMS, 1984).

At one time, the natives near the Gulf of Alaska planning area used to get virtually all of their food from subsistence. Even in the early 1960s most were still getting about 80 percent this way, but by 1975 a maximum of only 40 to 50 percent of the food was obtained by subsistence activities. The decline has been related to increased job opportunities, increased welfare and food stamp payments, and increased competition for the limited biological resources by both the increasing number of local and non-local hunters and fishermen.

Subsistence food items in the Gulf of Alaska area consists mainly of salmon and moose. Other subsistence items are harbor seals and seal oil, water-fowl, marine invertebrates, furbearers, seaweed, berries, greens, and hemlock branches.

Oil development and production activities although small (1 production platform) could affect populations of coastal fish species that live all or any part of their life in the area. The primary impact would be on egg, larval, and fry stages of the fishery resource.

Salmon could be affected during most of their life stages because pollutants from oil-related activities could affect the young, could cause avoidance of spawning areas, or reduce the food supply needed for optimum survival of the species.

Natives generally harvest only harbor seals as part of their subsistence requirements. Harbor seals could be affected by oil contamination of pupping rookeries and by the elimination of traditionally hauling grounds and rookeries through human construction or disturbance activities. Only 1 pipeline landfall and 1 shipping terminal is estimated. Although the potential exists for a decrease in the population level of harbor seals and the elimination of traditional hauling grounds (and noncomitant hunting areas), the significance of this impact would depend on the location of oiling and construction activities, time period, and the number of successive oilings.

Moose and furbearers utilize coastal beaches for foraging or transportation and are susceptible to becoming oiled and/or ingesting oil. The significance and magnitude of oil contamination on terrestrial wildlife would depend on the location and extent of contaminated beaches and season of the year.

The impact of any increase in human population, i.e., hunters, which might result from this proposal could have a more significant impact on moose populations and/or length of the hunting season than any possible oilings of beaches, or direct habitat encroachment.

Subsistence data tends to indicate that as the population of an area grows, the per capita subsistence harvest grows less due, in part, to the competition for limited biological resources. Growth in population would tend to further reduce the subsistence way of life in northern Gulf communities.

Local population growth will be low because of activities from this proposal. The one terminal/shipment center may not be anywhere near a village and if it is, most of the workers will live in enclaves. The low level of onshore activity attributed to this proposal will tend to reduce the opportunity to subsistence use.

CONCLUSION: The overall effect to subsistence in the planning area would be low.

CUMULATIVE IMPACTS: Increased tankering of Arctic crude from Valdez could increase the already existing threat of oil spills (10 over 35 years in the whole Gulf of Alaska) on the subsistence resources used by the residence of Tatitlek in Prince William Sound. Little increased risk to Yakutat would be expected from increased tankering of Arctic crude because of the distance from the tanker route. Tankering from Kodiak, Cook Inlet, or Shumagin should be well offshore from coastal communities. Only a marginal increase in oil-spill risk to subsistence resources would be expected from the proposal.

CONCLUSION: The cumulative effect of oil spills and other industry activities could result in moderate effects on subsistence in the planning area.

(i) Impacts on Sociocultural Systems

The following generic discussion of importing agents on sociocultural systems is to be used as general reference for the planning area specific analysis of sociocultural impacts that follow.

Sociocultural effects include serious alterations in community and family organization, serious institutional dislocations, disruption of family and community-based subsistence activities, erosion of cultural values and accompanying behaviors manifest in increased drug and alcohol abuse, homicide and suicide, and increased generational and marital strain. Many of these problems are common in Alaska onshore regions and could compete with OCS oil and gas exploration and development under the proposed 5 year schedule. One the other hand, it is important to assess baseline conditions in an area or region before assuming that observed changes in community and individual well-being are the result of OCS-induced changes.

OCS-induced changes are already occurring along with other oil and gas induced change in the Beaufort region. For example, in-migration of new groups of businessmen and other workers (adding competition for already scarce jobs); stress on the bowhead whale hunt and on other subsistence-related activities and practices; the occurrence of widespread irregularities in the Capital Improvements Programs recently revealed by the mayor to have occurred over approximately a four year time period; continuing problems with teenage and young adult drinking and drug abuse and relatively high levels of individual and family violence may be manifestations of these on-going changes. (Beaufort Sociocultural Monitoring Draft Final Report, 1985; Nuiqsut Case Study, 1984, newspaper accounts, 1985).

In contrast to this relatively high level of sociocultural change, other planning areas of the Alaska OCS, notibly the Shumagin and North Aleutian planning areas, are relatively untouched by industrial development of any sort. These predominantly fishing areas have yet to experience direct or indirect OCS impacts. They are relatively pristine natural environments, sparsely populated, except during peak fishing seasons. Residents of these planning areas are suspicious of the benefits to be obtained from oil and gas development. Most would prefer to be left alone.

A middle group of OCS planning areas has experienced minimal change associated with current or past OCS activity. Some of these areas now support OCS exploration having lived through minimal change and decided it was less harmful than expected. Kodiak and Yakutat appear to reflect this type of change. Others, like the Norton and Navarin planning areas (Norton Sound and Yukon and Kuskokwim Delta villages) continue to be apprehensive of potential OCS finds and therefore oppose further sales in the area. From the standpoint of OCS induced change, all of these areas have experienced relatively minor to moderate amounts of sociocultural change, including excellerated concern regarding land and resources and inter-village conflict on Kodiak Island, elevated prestige of community leadership (Yakutat) and increasing inter-village solidarity in the Yukon-Kuskokwim Delta region in opposition to oil and OCS.

One planning area, St. George, has tolerated about 2 years of OCS exploration, and supported Navarin and Norton exploration, largely centered in Dutch Harbor-Unalaska areas. The Cook Inlet area also, knows well the costs and benefits of oil and gas development, having hosted onshore oil and gas activity on State areas for about 20 years. In the case of Cook Inlet, further sociocultural changes due to OCS would be minor compared to past levels of offshore activity.

While two OCS regions have relatively high estimated oil resources (Chukchi planning area; 1152 million barrels and Navarin planning area; 1920 million barrels), eight OCS regions are estimated to contain less than 200 million barrels of oil each and 1751 BCF cubic feet of gas, the marginal probability of recovering commercial hydrocarbons is extremely low (less than 0.50). The Beaufort planning area is estimated to contain 627 million barrels of oil with an 80% probability of a commercial find. In that area, a sociocultural monitoring program has now completed its first year and is scheduled for retesting in two more years. Sociocultural monitoring in the North Aleutian and Navarin-Norton areas is scheduled in FY 1986 and FY 1987. Regular social indicators monitoring is also planned along the Alaska OCS. These studies should provide valuable information about changing sociocultural conditions in areas of OCS exploration and development and possibly help mitigate some of the potential effects. EISs have been used to assess sociocultural effects from specific sales in the Five Year Leasing Program. For greater detail the reader is referred to the Beaufort, Diaper, Norton, Navarin, North Aleutian, St. George, Kodiak, Cook Inlet, and Gulf of Alaska EISs.

Possible oil spills by planning area estimated for this five year planning period indicate a possibility of no more than one spill per planning area for all but three areas: Navarin Basin, Chukchi Sea and Beaufort Sea planning areas. In these regions there is a possibility of 6,3, and 2 spill, respectively over the life of the proposal.

Resources in the Gulf of Alaska area are projected 113 million barrels of oil and 1751 billion cubic feet of gas with a probability of .08 percent of being economically recoverable. Under present economic circumstances, sociocultural effects are therefore not likely to be great. For greater detail, refer to Cook Inlet/Gulf of Alaska FEIS, USDOI, 1984.

Except for Southeastern Alaska, the planning area generally encompasses parts of Alaska that already have gained experience with oil-and-gas development, either onshore or offshore. The Prince William Sound area has experienced the passage of crude oil tankers since the completion of TAPS, and Yakutat has been a base of operations for offshore exploration in the Gulf of Alaska since the mid-1970's. Specific communities (Valdez and Yakutat) experienced change as a result. The net effect has constituted as much a change in local sociocultural systems as a major learning experience for the regional community.

The proposal should add to this learning experience, but not contribute materially to change in regional sociocultural systems. Change is more likely at the community level, in the community nearest the 1 hydrocarbon shipping terminal and the 2 pipeline landfalls.

CONCLUSION: Sociocultural effects are expected to be low.

CUMULATIVE IMPACTS: Cumulative effects to regional sociocultural systems, if any, should be localized essentially at the community level in the Gulf of Alaska. One additional Federal offshore lease sale is programmed for the Gulf of Alaska under the proposed lease schedule. Federal offshore and onshore leases are likely to contribute to the product transported to market out of Valdez, but these sales would be less a contribution to cumulative effects to sociocultural systems as a form of substitution to existing levels of risk to locally used subsistence resouces from TAPS tankering.

In the Cook Inlet/Shelikof Strait region, localized sociocultural systems based on a fisheries orientation could be affected by additional Federal lease sales in the Gulf of Alaska region, Shumagin, and lease sales in the southern Bering Sea that would contribute to the rationale for having a major oil terminal sited on the south side of the Alaska Peninsula. This would introduce a new element of industrial activity to the western sector of the subregion which would offer the potential of introducing major change to selected local sociocultural systems. However, it is unlikely that this would be the case with the subregion as a whole.

Yakutat went through a considerable learning process as a result of previous Federal offshore lease sales in the Gulf of Alaska. Except for the proposal, no additional oil sales are expected in the Yakutat area. Consequently, the cumulative effects of the proposed lease sale at Yakutat are minimal compared with the potential effects of Lease Sale 88 on sociocultural system at Yakutat.

CONCLUSION: Cumulative effects are expected to be moderate.

b. Unavoidable Adverse Effects

(1) Biological Environment

(a) Fish Resources

Some mortality of fisheries resources in the immediate vicinity of seismic activities, drilling and production discharges, or in an area contacted by an oil spill is considered unavoidable. If oil spill contingency plans are carried out effectively and cleanup techniques are successful, unavoidable oil spill effects could be reduced substantially. A spill which contacted nearshore areas and beaches, however, may not be cleaned up completely and may continue to affect fisheries resources using these areas, as the hydrocarbons are released from beach or bottom sediments over time. Overall, unavoidable adverse effects are expected to be localized and low.

(b) Coastal and Marine Birds

Some mortality of marine birds in the immediate vicinity of an oil spill in open water in any of the planning areas is considered unavoidable. If oil spill contingency plans are carried out effectively and cleanup techniques are successful, unavoidable oil spill effects could be reduced substantially. However, a spill which enters lagoons or marshes may not be cleaned up completely. It may thus contact birds at a later date and result in some mortality. Some long-term effects of exposure to oil and/or disturbance also may be unavoidable. Overall, unavoidable adverse effects are likely to be localized, short-term for the most part, and low.

(c) Marine Mammals

Some effects on marine mammals in the immediate vicinity of an oil spill are considered unavoidable. If oil spill contingency plans are carried out effectively and cleanup techniques are successful, unavoidable oil spill effects could be reduced substantially. Some long-term effects of exposure to oil and/or disturbance also may be unavoidable. Overall, unavoidable adverse effects are likely to be localized, short-term for the most part, and low.

(d) Nonendangered Cetaceans

The magnitude of unavoidable effects on nonendangered cetaceans is difficult to quantify at this time. Uncontrolled noise and other forms of disturbance associated with the proposal (i.e., tanker and aircraft traffic or related geophysical activities) may cause temporary behavioral responses in those species which may not habituate to noise disturbances. As several nonendangered cetaceans appear to have habituated to some noise and disturbance (to some degree), effects from additional disturbances associated with the proposal are expected to be very low.

(e) Endangered Cetaceans

The magnitude of unavoidable effects on endangered whales is difficult to quantify at this time. In the event of development, the likely probability of spill occurrence in certain areas indicates that summer-feeding areas may be subject to at least localized risk. Uncontrolled noise and other forms of disturbance associated with the proposal (e.g., noise due to vessel activity or aircraft overflights, tanker traffic, or related geophysical activities) may cause temporary behavioral responses. These responses are not expected to preclude migrations or disrupt feeding activities. Such disturbance-related effects would be most likely to occur to gray whales during summer-feeding periods or when they are migrating in the nearshore area. Other endangered cetaceans which frequent the shelfbreak areas during the summer-feeding period (such as fin, sei, blue, and sperm whales) could also be affected by the aforementioned activities. However, present knowledge of petroleum-related activity and its effects on cetacean fitness from unavoidable adverse effects is currently under study, and relationships between development and effects are refined with each new study. Unavoidable adverse effects probably would not exceed low.

(f) Endangered and Threatened Birds

Unavoidable adverse effects on the Aleutian Canada goose, short-tailed albatross, and peregrine falcon as a result of this proposed leasing sale would likely be very low.

(2) Socioeconomic Environment

(a) Commercial Fishing Industry

Some preemption or loss of fishing area and subsequent loss of harvest through emplacement of oil industry facilities (platforms, pipelines, and subsea completions) is considered unavoidable. Oil spills could cause unavoidable fouling of gear (mostly crab buoys), temporary preemption or foreclosure of fishing grounds, and tainting or perceived tainting, all of which could cause an unavoidable low loss in catch and/or income to fishermen.

(b) Local Economy

No unavoidable adverse effects are anticipated.

(c) Community Infrastructure

Some small villages adjacent to planning areas may experience some difficulty in financing public-service demands resulting from the proposal; however, due to the minimal increases in demand created by the proposal, this seems unlikely and would be very low.

(d) Subsistence-Use Patterns

Oil spill incidents could result in unavoidable direct loss of subsistence resources. Other potentially unavoidable adverse effects on subsistence-use patterns could include: (1) a further erosion of values underlying subsistence-based living as a result of increased regulation of resources to reduce pressures thereon; (2) increased resident dependency on transfer payments or other forms of cash substitution to compensate for unmet subsistence needs; and (3) increased levels of instability in subsistence-based systems of organization in response to perceived or actual threats to biological systems. It is estimated that unavoidable adverse effects would be very low.

(e) Sociocultural Systems

In the coastal regions, the perceived or actual threat to subsistence resources, or the indirect or induced consequences derived therefrom, could produce unavoidable increased levels of anxiety over the relative stability and reliability of sociocultural systems that are based on subsistence practices, values, and orientation. A comparable unavoidable response also could be realized if commercial salmon fishing were actually, or thought to be, endangered, not only because of the economic consequences but also because of the effects on occupational identity and sociocultural systems, which are based on commercial fishing as the primary resource of the subsistence-based economy. Unavoidable adverse effects are not anticipated to exceed low.

(3) Other Issues

No significant unavoidable adverse effects are expected on coastal management programs as a consequence of the proposal.

(a) Water Quality

The only unavoidable adverse effect on water quality anticipated from the proposed action is input of large quantities of hydrocarbons through accidental spillage. Although it would be an obvious impairment of the planning area's pristine water quality, spillage would have a low long-term effect on water quality.

(b) Air Quality

Offshore oil and gas development and the development of LNG plants would cause slight increases in onshore concentrations of NO_x, SO_x, TSP, CO, and O_2. Emission controls or appropriate emission standards. Unavoidable adverse effects would be very low.

(c) Archaeological Resources

Any disturbance to a archaeological site could cause dislocation of artifacts, with atendant loss of information or in the extreme, complete destruction of the site. Archaeological sites along shorelines could be adversely affected by cleanup activities if an oil spill should contact a shoreline. However, most beach sites discovered to date have already been altered by swells, waves, or ice. Unavoidable adverse effects are expected to be low.

(d) Transportation Systems

The use of the transportation scenario for the proposal would have the effect of introducing an increased level of infrastructure into a relatively primitive area. The use of a pipeline or road system by the public may extend hunting activities to areas presently unaffected by such activities. However, the unavoidable adverse effects are expected to be low.

(e) Land Use Plans

Land-use effects resulting from the proposal would be avoidable rather than unavoidable. Land-use effects could be mitigated by site-planning and land use regulations.

Development of a pipeline and a terminal at any of many sites along the Alaskan coast could have an effect on an area's wilderness values. Construction and maintenance activities could impair an area's natural characteristics through alterations of soils and vegetation. During the life of the facilities, noise and visible support facilities also would have a high unavoidable adverse local effect on an area's wilderness values. Although careful planning could lessen the overall effect, developments of this nature could destroy the wilderness character of an area.

c. Relationship between Local Short-Term Uses and Maintenance and Enhancement of Long-Term Productivity

In this section, the short-term effects of oil and gas leasing and uses of various components of the environment in the planning lease area are related to long-term effects and the maintenance and enhancement of long-term productivity of the environment. The effects of the proposed action would vary in kind, intensity, and duration, beginning with preparatory activities (seismic-data collection and exploration drilling) of oil and gas development and ending when the development of the oil and gas field is completed and allowed to return to a natural state.

In general, "short term" refers to the useful lifetime of the proposal, but some even shorter-term uses and effects are considered. "Long term" refers to that time beyond the lifetime of the proposal. The oil-producing life of the field in the planning lease sale area is estimated to be about 35 years. In other words, short-term refers to the total duration of oil exploration and production, whereas long-term refers to an indefinite period beyond the termination of oil production. This indefinite period will vary from one environmental component to another.

In the short-term, biological productivity would be lost on all onshore lands used for support activities of the proposed project. With proper management, these areas could be returned to productivity in the long-term. Although restoration may not be entirely feasible, the overall loss would result in a minor adverse effect. The direct land requirements would show in both the short-term and the long-term because of disturbance. Construction of pipelines and terminal facilities would cause definite short- and long-term changes. Some biological species may have difficulty repopulating and could be displaced. Similar effects also would occur at other locations hypothesized as terminal sites.

Short-term oil pollution and the possibility of long-term cumulative oil pollution effects could cause serious adverse effects on all components of the marine ecosystem, including fisheries. While restoration would allow fisheries production to regain original levels, any reduced annual harvests during the life of the project would be irretrievably lost.

Fresh-water pollution from onshore activities is a short-term effect. Any degradation of water quality is expected to be short-term and localized, with no long-term degradation anticipated.

The biota would be threatened by potential short-term oil pollution. Direct mortality could be significant through the combined effects of human harassment and the increased frequency and volume of noise from vessel traffic or overflying aircraft. Such disturbances could alter behavior patterns and drive fauna away from traditional feeding and breeding grounds or to other critical areas within their range, thereby reducing species populations over a long period of time.

Habitat destruction could cause a reduction in subsistence species, such as salmon, and thus could threaten the regional economy. Improved accessibility t primitive areas as a result of support facility construction is a short-term result of this proposal. Overall coastal wilderness values may decrease from increased land use. Increased human populations in the short-term could change the regional native culture in the long-term. The subsistence way of life coul be modified and population shifts could occur. Only those residents affected b the overall sociocultural changes can define them as positive or negative in th long-term.

The redistribution or reduction of species populations in the short-term could affect regional subsistence-use patterns. Such regional patterns also could b affected in the short-term if commercial fishing, as a means of identity and livelihood, were affected. Such short-term effects on subsistence-use pattern from the proposal would not be expected to have long-term consequences, except as one of numerous sources of social disruption, or unless chronically imposed on the resource base of the region. In the short-term, increased human popula tion and industrial activity could change the culture of the area in the long-term to more fully incorporate an urban perspective toward individual and social relations and household modes of income production.

Improved accessibility to primitive areas as a result of support-facility construction is a short-term result of this proposal. Overall coastal wilderness values may decrease from increased land use, particularly along the proposed pipeline route.

Archaeologic and historic values discovered during development would enhance long-term knowledge. Overall, discoveries could lead to location of additional sites, but destruction of artifacts would represent a long-term loss.

Consumption of offshore oil would be a long-term use of nonrenewable resources. Economic, political, and social benefits could accrue from the availability of oil. Consumption would decrease the nation's current dependency on oil imports and create short-term benefits. If additional petroleum resources were discovered and developed in the planning area, the proposed production system would enhance future extraction.

Oil production would provide a short-term, critically needed energy source and perhaps provide time either for the development of long-term alternative energy sources or substitutes for petroleum feedstocks. Petroleum development in this area also could mean the irretrievable loss of some fisheries production. Maintenance and enhancement of long-term fisheries productivity would depend on efforts to control water-quality levels. Regional planning could aid in controlling changing economics and populations and, thus, in moderating adverse effects.

d. Irreversible and Irretrievable Commitment of Resources

(1) Minerals Resources

Whatever resource levels of the proposed action are produced, they would be irretrievably consumed.

(2) Biological Resources

(a) Fish Resources

Some ground fish, crab, herring, and salmon could be lost if oil spills occurred and interfered with migrations or directly contacted larval fishes and/or their planktonic food supplies. Impacts would be low.

(b) Birds

Should an oil spill occur in the planning area, some marine and coastal birds contacted could be lost to their populations. Construction of terminal facilities could displace some nesting seabirds and waterfowl, resulting in the loss of some annual productivity, but effects would be localized wherever they happened. Impacts on regional populations would be low.

(c) Marine Mammals

Under the proposal, it is possible that marine mammals could be subjected to irreversible direct and indirect effects of oil spills, disturbance due to noise and other human activities, or losses and/or alteration of habitat due to facility developments. Such effects may lead to long-term losses of nonendangered cetaceans, but overall population effects would be low.

(d) Endangered and Threatened Species

Under the proposal, it is possible that endangered and threatened species could be subjected to irreversible direct and indirect effects of oil spills, disturbance due to noise and other human activities, or losses and/or alteration of habitat due to facility developments. Impacts would be low.

(3) Economic Systems

The only commitment that could be considered irreversible and irretrievable would be the economic risk, resulting from Federal offshore activity, of reduction of commercial fisheries or marine mammal resources or destruction of the fauna or flora used for subsistence by area residents. Impacts would be very low.

(4) Social Systems

Village subsistence practices could be affected irreversibly by the displacement of subsistence resources from locally used customary habitat or by the reduction of resources through the modification of favorable habitat. The displacement could be irretrievable if the effect were maintained over time. Irreversible changes in cultural values and orientations could occur from the proposal, but the irretrievable nature of these changes to sociocultural systems is unknown. Impacts would be low.

(5) Land Use Plans

Some irreversible changes would occur wherever support bases were developed. Land forms could be altered and some site-specific current and anticapated uses could be precluded. Impacts would be low.

(6) Archaeological Resources

Irretrievable material products of prehistoric culture such as archeological sites may be lost through looting and indiscriminate or accidental activity on known and currently unknown sites. Impacts would be low.

e. Impacts of a High Case Scenario

This section provides a discussion of the potential environmental impacts that could occur in the unlikely event that all unleased, undiscovered, economically recoverable hydrocarbon resources in the Gulf of Alaska planning area are leased and developed as a result of the proposal. The estimated "High Case" hydrocarbon resources for the Gulf of Alaska Planning area are: 490 million barrels of oil and 8000 billion cubic feet of gas. These estimates are considerably higher than the "Base Case" for the proposal. Infrastructure expected to be used to explore and develop these resources includes 61 exploration and delineation wells, 185 development wells and 5 platforms. This is significantly different from the proposal (12 exploration and delineation wells, 42 production wells and 1 platform). In addition, the estimated number of oil spills 1,000 barrels or greater is 3 or 2 more than the proposal.

It is important to point out that the Gulf of Alaska area does not have existing offshore development. Resource estimates and infrastructure for the high case are about the same as the cumulative case. However, the high case assumes that the resources will be developed as a result of the proposed 5-year program while the cumulative assumes that leasing and development will extend over future 5-year programs lease sales.

(1) Physical Environment

(a) Impact on Water Quality

The impacts on water quality would be the same as those of the proposal (very low).

(b) Impact on Air Quality

The impacts on air quality would be the same as those of the proposal (very low).

(2) Biological Environment

(a) Impact on Plankton and Benthos

Overall impacts on plankton and benthos, would be the same as the proposal. Since the high case assumes approximately three times the level of hydrocarbon resources as that estimated for the base case, diluted discharges of formation waters and drilling muds, and cuttings from offshore locations might cause lethal or sublethal effects on organisms using pelagic areas (e.g., scallops, adult shrimp, other invertebrates and their planktonic food web organisms). These discarges, however, will increase the impacts on only a small portion of these widespread populations, and could result in low on regional planktonic and benthic populations.

Three offshore oil spills are assumed. This could result in increased mortality, primarily on adult shrimp (pelagic) and planktonic food web organisms. A major oil spill which contacted nearshore areas being used by planktonic eggs or larvae of shrimp, clams, scallops or other invertebrates could result in moderate impacts on these species, depending on the portion of a local population present, the life stage, real extent of the spill,

the concentration of hydrocarbons and length of exposure. In addition, a major spill which contacted and exposed nearshore areas to concentrations of hydrocarbons when vulnerable life stages were present could be expected to produce moderate effects on a portion of a local population. Oil spills which reach nearshore waters could affect the clam resources of the planning area. Overall the high case impacts on plankton and benthos (regional populations) are expected to be low. Impacts on local populations could be moderate.

(b) Impact on Fisheries Resources

Overall impacts on fisheries resources due to seismic activities, oil spills, and discharges of drilling muds, cuttings, fluids, and formation waters associated with the high case scenario would be greater than those described for the proposal. Since the high case assumes over three times the level of hydrocarbon resources as that estimated for the base case, an increase in spill-contact probabilities for areas used by concentrations of the more susceptible lifestages (e.g., pelagic egg and larval stages) of fisheries resources would be expected. Drilling and production discharges could increase. Consequently, localized lethal and sublethal concentrations--which could affect a portion of one or more fisheries populations--could increase. The overall impacts of these increases in drilling and production discharges, seismic activities, and oil spills are not expected to exceed moderate, as compared to low overall impacts for the proposal.

(c) Impacts on Marine Mammals

If an oil spill were to occur, impacts on marine mammal populations could be as described for the proposal. If an oil spill were to enter the area surrounding principal rookeries or breeding areas for any species or high-density sea otter area, high impacts could result. Throughout most of the planning area, however, the impacts of the proposal on regional marine mammal populations are expected to be moderate. While low distrubance effects could occur in a few local areas, overall disturbance is likely to be moderate. However, with high case resources (over three times the resource estimate for the proposal), the probability of oil spills occurring and contacting ma centration areas and the number of spills likely to occur increases from one to three thus increasing the potential for contact with marine mammal populations. In particular sea otter concentrations in the northern Gulf Alaska-- could experience moderate oil-spill effects if high-case resources were developed.

(d) Impacts on Coastal and Marine Birds

If an oil spill were to occur, impacts on marine and coastal bird populations could be the same as those described for the proposal. According to the conclusion presented for the impacts of the proposal, if a spill were to enter the area surrounding a major nesting colony or a heavily used staging area during migration, high impact could result. However, throughout most of the planning area, impact of the proposal on regional populations of marine and coastal birds are expected to be low. However, with high case resources (over three times the base resource estimate), the probability of oil spills occurring and contacting bird concentration areas and the number of spills increases to three. In particular, nesting seabirds and overwintering seabirds/waterfowl in Southeast Alaska--as well as nesting waterfowl and migrating shorebirds/waterfowl in the northeastern Gulf of Alaska--could experience high oil-spill effects, compared to moderate regional impacts.

(e) Impact on Endangered and Threatened Species

Endangered species could be directly and indirectly impacted by oil spills and/or disturbance. The potential for spills and disturbance associated with development and transport of extracted high case resources would be greater than that described for the base case, although the logistical and product-transportation patterns would be the same. Since the high case assumes over three times the level of hydrocarbon resources as estimated for the base case, an increase in spill-contact probabilities would be expected. Increased noise disturbance associated with higher levels of development which would be expected with the high case could result in localized changes in distribution and/or density of sensitive endangered species. Endangered whales could possibly avoid an area for a longer period of time or not even go to an area. Avoidance of spring-summer concentration areas or major feeding areas eventually could be expressed in the fitness of the species. The effects of oil spills and disturbance on migrating whales (especially gray whales) could possibly be as high as moderate, compared to low for the base case. The impacts of oil spills and disturbance on those species not as common in the planning area probably would not exceed moderate.

(f) Impact on Estuaries and Wetlands

These topics are discussed and impacts analyzed where they occur as habitat for the fish and wildlife species in (4)(a) through (4)(f) in alternative I.

(g) Impact on Areas of Special Concern

These areas are all habitat for the fish and wildlife species in (4)(a) through (4)(f) and impacts are discussed as they occur in the planning areas.

(h) Impact on Marine Sanctuaries

There are no marine sanctuaries in the Alaska OCS Region.

(3) Socioeconomic Environment

(a) Impact on Employment and Demographic Conditions

The development scenario for the high case indicates that the workforce necessary to produce the estimated resources in the planning area would be greater than the workforce anticipated in the proposal. Based on this premise, it is assumed that resident populations and the demand on facilities and services in Seward, Yakutat,and Cardora --which are anticipated to support offshore operations for the high case--would be greater than the infrastructure demands estimated for the proposal.

Population levels would increase over those estimated for the proposal and increases in population could have moderate effect on the infrasturctures of, Seward, Yakutat, and Caradova. The potential demand for services would be acute in villeses, where the water-supply and sewage-treatment facilities are currently operating at capacity. The level of impact may be as high as moderate on a local level and low regionally.

(b) Impact on Coastal Land Uses

The overall impact on residential and industrial land uses and plans in the, Seward, and Yakutat and Cordova areas which are proposed as support-base sites in the high case resource scenario--would be the same as those forecast for the base case, except that residential land demands are anticipated to double. Low land-use impacts are anticipated in these cities, since they have existing facilities or have allocated industrial waterfront areas for OCS uses. Also, adequate land suitable for residential development exists in these cities to accommodate the increased residential land requirements. The level of impact may be low.

(c) Impact on Commercial Fisheries

With the high case level of oil-and-gas development, it is assumed that commercial fisheries operating in the Yakutat area of the Gulf of Alaska would be subject to the impacts of this development. Yakutat has been selected as the scenario-site of the gas-processing facility, which would increase tanker traffic through fishery areas around Yakutat. Increased oil production also would increase tanker traffic through the area and would increase the risk of spills affecting the fishing areas.

Other areas may be affected because of increased oil production; however, it appears that in the Yakutat area the impacts would be greatest. These impacts would entail: (1) oil spills and/or oil-industry vessels (including seismic boats) causing damage to or loss of fixed commercial fishing gear; (2) competition for ocean/harbor space between the two industries; (3) competition for labor and materials between the two industries; (4) reduction in catch or tainting of catch caused by oil spills; and (5) increased oil-spill risk.

Based on previous exploration experiences in the Gulf of Alaska near Yakutat, levels of effects would be low. However, in the high case, oil-resource levels are approximately three times greater than predicted for the proposal; and a gas treatment-shipping facility may be located at Yakutat. Therefore, the impacts on commercial fishing in this area, both domestic and foreign, would increase from those assessed for the proposal. It is surmised that because gas treatment and shipping are relatively non-polluting and the high case resource estimates are still relatively low, that effects to the commercial fishing industry in the Gulf of Alaska planning area would be low. Impacts may reach the low level in the Yakutat region.

(d) Impact on Recreation and Tourism

Recreation and tourism would be affected by the high case to a considerably greater degree due to an increase in visitors to recreational sites around

Yakutat. Changes in recreation property values are more likely to occur, and visual recreational parameters are more likely to change in the high case. Recreational areas such as the Situk River, which are near oil-development infrastructure facilities, are likely to be more heavily affected. The level of impact is expected to be low.

(e) Impact on Archaeological Resources

Compared to the proposal, the high case would double impacts on resources. There would be an increase of visitors to archaeological national registered sites, more chance of any damage to shore sites due to oil spill cleanup operations, and the same chance of disturbance to offshore resources from pipeline and/or drill-rig activity. Gas activity would be most likely to affect archaeological resources near Yakutat. The level of impact is expected to be low.

(f) Impact on Subsistence Use Patterns

Due to greater land use, higher levels of activity, and larger quantity of oil transported, there would be increased opportunity for conflict with subsistence activities. A moderate impact could result.

(g) Impact on Sociocultural Systems

A larger labor force is associated with the high case, but the locations of facilities and services to serve the needs of offshore operations essentially are the same as the proposal. Most all communities (e.g. Cordova and Seward) associated with support facilities and services, except Yakutat, have sufficiently diverse sociocultural systems to accommodate the added increment of growth. The sociocultural systems at Yakutat could be stressed due to the added increment of growth and the possible addition of a natural-gas processing facility. Thus, the impacts of the high case on sociocultural systems could be increased levels of contradiction and stress within the social and political structure of the community over growth management. These impacts could be moderate. Low impacts are predicted for the proposal.

(h) Impact on Transportation

Overall transportation-system stress resulting from activities based on the high case are expected to be on an average of approximatly three times greater than effects attributable to the base case. Focus of impacts would be on the Yakutat area. Development phase activities could be particularly great during the construction of LNG and oil-terminal facilities and their related docking facilities. Overall impacts could be considered to be moderate whereas low regional impacts are predicted for development of proposlal.

(i) Impact on Military

This subject is not discussed because there are no restricted military areas on the Alaska OCS.

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f. Impact of Alternative II - Subarea Deferrals

This alternative evaluates the possible deferral of 13 subareas. These are in addition to the 14 subareas deferred under Alternative I. None of the additional subarea deferrals included in Alternative II are within this planning area. Therefore, the expected environmental impacts of Alternative II in this planning area are identical to the expected impacts of the proposal.

g. Impact of Alternative III - Add a Sale in the Straits of Florida

Adding a sale in the straits of Florida will not effect this planning area. However, under Alternative III all sales proposed in Alternative I - the proposal, would be held. Therefore, the expected impacts of Alternative III are identical to Alternative I for this planning area.

h. Impact of Alternative IV - Biennial Leasing

Because no difference is anticipated in the number of sales and, therefore, as difference in development assumptions for this planning area between this alternative and the proposal, there will be no change in impact levels for the resources analysed in the physical biological and socioeconomic environments.

i. Impact of Alternative V - Acceleration Provision

Because no difference is anticipated in the number of sales for this planning area between this alternative and the proposal. There will be no change in impact levels for the resources analysed in the physical, biological and socioeconomic environments.

j. Impact of Alternative VI - Defer Leasing in Six Planning Areas: North Atlantic, Washingtin and Oregon, Northern California, Central California, Southern California, and North Aleutian Basin

Selection of Alternative VI would defer the North Aleutian Planning Area (Alaska OCS Region) from leasing. The impacts reulting from this alternative would not change impacts assessed to the proposal for the Gulf of Alaska Planning Area.

k. Impact of Alternative VII - No Action

Under this alternative, the Secretary of the Interior proposes not to schedule any oil and gas lease sales for this proposed 5 year program. All potential impacts to the physical, biological, and socioeconomic environment resulting from hydrocarbon exploration, development, and production would be eliminated.

Oil and gas are currently the nation's primary energy source. Even with a vigorous conservation program the United States demand for energy will continue to grow. With the adoption of Alternative VII the oil and gas that would have been available as a result of this proposed program would no longer contribute to the national domestic production during the life of the program.

With the removal of the potential oil and gas into the national energy reserves, it would necessitate the increased production of energy from other conventional and non-conventional energy sources (See Appendix C), and/or increases in import levels from foreign sources. Impacts resulting from the development of the alternative energy sources are summarized in Section II.A.7 and discussed further in Appendix C.

12. Kodiak

a. Alternative 1

The proposal includes the holding of one sale in the Kodiak planning area. It is estimated that the sale will produce about 95 million barrels of oil (MMbbls) and 1840 billion cubic feet (BCF) of gas over a 35 year period. These resources will be produced from 23 production wells from one platform. In addition to the oil and gas, about 250 MMbbls of formation waters will be produced. Approximately 262 thousand barrels of drilling muds and fluids and 578 thousand barrels of drill cuttings could be discharged into the sea over the life of the proposal. About 10 exploration wells will be drilled over a five year period anticipated that one support bases will be expanded and that at least one onshore facility will be developed. For a generic description of impacts on all resource categories Section IV.B.11.(3), (4) & (5). Area specific discussion follow.

(1) Interrelationships of Proposal with other Projects and Proposals

Section IV.B.11.a.(1) presents a discussion of the interrelationship of the proposal with other projects and proposals for all Alaskan planning areas.

(2) Projects Considered in Cumulative Impact Assessment

Section IV.B.11.a(2) presents a discussion of the projects considered in the cumulative impact assessment for this planning area.

(3) Physical Environment

(a) Impact on Water Quality

In the Kodiak Planning Area anchoring of exploration (10) or the one production platform and entrenchment of pipelines (2) would increase turbidity only temporarily over a limited area. Platform discharges of drilling fluids during exploration and production would contaminate less than one square kilometer per drilling platform. Production, but not exploratory, discharge would continue intermittently over 30-35 years. The one oil spill of 1,000 barrels or greater that is assumed could significantly, but temporarily, increase water column hydrocarbon concentrations over several hundred kilometers causing a temporary degradation of water quality. See Section 11.3.a. for generic impact discussion on water quality. Because of the low level of anticipated activity and pollution opportunity, impacts on water quality would be low.

CONCLUSION: Impacts on water quality from the proposal would be low.

CUMULATIVE IMPACTS: Cumulative impacts on water quality may be observed from additional development projects in the Kodiak region. However, cumulative oil spill numbers remain at one over 1000 barrels, the same as the proposal. Oil and gas leasing in the territorial waters of this region would yield wastewater discharges estimated to closely approximate the proposal. These effects are likely to be very low. It should be noted, however, that it is difficult to judge the significance of these additional effects in the absence of site-specific information on the volume of effluent loading, the contaminants being discharged, and the mixing characteristics of the receiving waters. Cumulative water-quality effects from subsequent development proposals will be evaluated in future EIS's on major actions.

CONCLUSION: Cumulative impacts on water quality in the Kodiak Planning Area are estimated to remain low.

(b) Impact on Air Quality

In the Kodiak Planning area impacts on air quality from the proposal are expected to be insignificant. Air quality impacts ensuing from this proposal are expected to be analogous to those identified in the EIS's on OCS sales 46 (Kodiak) and 60 (Lower Cook Inlet-Shelikof Strait) for the following reasons: (a) air quality assessment on proposed OCS sales in Alaska is based on pristine ambient air quality conditions; (b) the air quality assessment of offshore emission sources is based upon emmissions inventory and pollutant trajectories from individual exploratory vessels or production platforms; (c) the onshore air pollutant levels from individual offshore emissions sources is estimated to be insignificant as shown is the DEIS on proposed sale 46 and the FEIS on sale 60; and (d) onshore emission sources in frontier OCS development areas are expected to be no greater than existing ambient concentractions in the Kenai-Nikiski area (as shown in the sale 60 FIES) where petroleum production, refining, gas liquefaction, and marine loading operations occur. No violations of any national or state air quality standards are anticipated.

In addition, the low level of anticipated activity, 12 exploritory wells spread out over five years; one production platform and one onshore shipping facility will keep the level of air quality impacting factors at a low level. See sec. IV.11.(4).(b) for a discussion of generic air quality impacts.

CONCLUSION: Impact on air quality from the proposal would be low.

CUMULATIVE IMPACTS: Cumulative effects of offshore emissions also are expected to be low because activity levels and discharges will be close to that of the proposal. The cumulative amount of offshore emissions which could occur nearshore may be estimated by combining the emissions estimated for the proposal and Cook Inlet, Gulf of Alaska, and Shumagin Planning areas. The combined production-related emissions could exceed Department of the Interior air-quality analysis exemption levels for all pollutants if all operations were located at common boundaries within five kilometers (3 miles). This is highly unlikely, especially because prior tract bids indicate interest much farther offshore and widely dispersed. The assumed one oil spill of 1000 bbls or greater barrels is the same as for the proposal.

Cumulative air quality effects would be seen as a result of the piping of natural gas from an LNG facility. This facility would have to meet all Federal and State air quality standards and Class II PSD standards and, as such, control technology would be required. Again, because an oil storage and marine-loading terminal would be required to meet State and Federal ambient air quality and Class II PDS limitations, no unavoidable effects on air quality are foreseen.

CONCLUSION: Cumulative effects of the proposal on air quality would be low.

(4) Biological Environment:

(a) Impact on Plankton and Benthos:

The estimated level of exploration (12 wells in 5 years) and production (1 platform) activity and the limited radius of effects (1km/per drilling platform) would result in very low effects on Kodiak area planktonic and benthic organisms. Diluted discharges of formation waters and drilling muds and cuttings, (about 250 thousand barrels and 840 thousand barrels respectivity) from offshore locations in the planning area might cause lethal or sublethal effects on organisms using pelagic areas, including scallops, adult shrimp, other invertebrates, and their planktonic food web organisms. These discharges, however, will affect only a small portion of these widespread populations, and could result in low effects on regional populations.

The one estimated oil spill of 1,000 barrels or greater not contacting important nearshore areas could result in limited mortality, primarily on adult (pelagic) shrimp and planktonic food web organisms. Even a major oil spill is expected to result in only a low effect on regional populations. An oil spill of 1,000 barrels or greater which contacted nearshore areas being used by plantonic eggs or larvae of shrimp, clams, scallops, or other invertebrates could result in moderate effects on these species, depending on the portion of a population present, the life stage, areal extent of the spill, the concentration of hydrocarbons, and length of exposure. Shrimp at their current depressed population levels could be particularly vulnerable to the one estimated spill. There is, however, a relatively low probability (26%) of an oil spill greater than 1,000 barrels resulting from this proposal. Therefore, the risk of a spill occuring and contacting shore is relatively low. Only a major spill which contacted and exposed nearshore areas to lethal concentrations of hydrocarbons when vulnerable life stages were concentrated in those areas is expected to produce a moderate effect on a portion of a regional population.

Nearshore areas are used by concentrations of spawning adults, planktonic larvae, and juveniles. Larvae are particularly sensitive to hydrocarbon exposure, experiencing lethal concentrations at .01 ppm (USDOC, 1983). During the most sensitive period, the molt, larvae exposure to 8 ppb of napthelene experienced narcosis and death (USDOI, 1981).

In addition, chronic exposure of clams to hydrocarbons can result in inability to attach to the substrate, a depressed rate of shell closure resulting in more exposure to predation, and inhibitio of oxygen uptake.

An oil spill reaching nearshore waters could afect the clam resoruces of the Kodiak area and may result in moderate impacts. Many razor clam were killed following the Amoco Cadiz tanker spill off the coast of France (USDOI, 1981).

The low resource levels (oil and gas) result in only one spill over 1,000 barrels sometime in the 35 year life of the proposed. And this has only a 26% chance of happening. These factors greatly reduce the risk of impact on plankton and benthos.

CONCLUSION: Impacts of this proposal on regional populations are expected to be low. Impacts on local populations could be moderate.

CUMULATIVE IMPACTS: Activities which may produce cumulative effects on planktonic and benthic organisms include other Federal and State ongoing and proposed hydrocarbon development, commercial fishing operations, and other nonpetroleum industry activities. The cumulative spill rate is one over 1,000 barrels, other activities closely approximate the proposal.

Tankering from existing and proposed leases in the Gulf of Alaskan Region and the Bering Sea will not significantly increase effects discussed for the proposed planning area. Cumulative spill effects tend to be greatest at locations where tanker traffic may be concentrated such as Hinchinbrook Entrance (not in the Kodiak Planning Area).

CONCLUSION: Regional populations of plankton and benthic organisms could experience low impacts. Local impacts could be moderate.

(b) Impact on Fish Resources

The assessment of impacts on fish resources has been divided into sections on salmonids, herring, groundfish, and crab.

Salmonids: The five species of Pacific salmon and the steelhead trout may be affected by seismic activity, drilling discharges, and oil spills. Salmon are present in the Kodiak area during smolt outmigration in the early spring and adult inmigration all summer. Adult salmon are present far offshore all year round. The effects of seismic activity have been described in a previous section (IV Dlb(2). The estimated level of exploration (12 wells) and production (1 platform) activity for the Kodiak area and the limited radius of effects would result in very low effects on salmonids.

Diluted discharges of formation waters and drilling muds, cuttings, and fluids from offshore locations in the planning area could effect salmonids, as discussed in Section IV.B.11.a.(4); however, these discharges will generally have very low if any, effects on salmonids.

An oil spill which contacted nearshore areas being used by prespawning adults, fry, and juveniles could result in a moderate effect. The effect of oil on salmonids is discussed in detail in Sections IV.B.11.a.(4) and IV.B.15.a.(4).

In summary, only an oil spill (one over 1,000 barrels) which contacted and exposed nearshore areas to lethal concentrations of hydrocarbons when vulnerable life stages (smolts) were concentrated in those areas is expected to produce a moderate effect on a portion of a regional Kodiak Salmonid population. The aggregate lethal and sublethal effects of seismic activities, drilling and production discharges, (about 840 thousand barrels of muds and cutting) and other oil spills are expected to affect only localized groups of salmonids in the immediate vicinity of such events. If the one oil spill assumed occurs and contacts nearshore areas while prespawning adults, fry, and juveniles are present, moderate effects could result.

CONCLUSION: Impacts of this proposal on regional populations of salmonids are expected to be low. Moderate impacts could occur to local populations.

CUMULATIVE IMPACTS: Activities which may produce cumulative effects on salmonids include other Federal and State ongoing and proposed petroleum development (IV.B.11.a.(2), commercial fishing operations, and other non-petroleum industry activities.

Tankering from existing and proposed leases in the Gulf of Alaska Region and the Bering Sea is not expected to increase effects discussed for the proposal. Tankers are not likely to pass near the proposed areas. Cumulative spill effects tend to increase only at locations where tanker traffic may be concentrated (Hinchinbrook Entrance, Unimak Pass) which are not in the Kodiak Planning Area. Spill rates (1 over 1,000 barrels) and other impacting factors closely approximate the proposal. Salmonids using the Kodiak area may experience increased oil-spill effects as a result of the increased cumulative risks. Salmon migrating toward Kodiak may also experience increased effects as a result of the increased cumulative probability.

CONCLUSION: Regional salmonid populations could experience low impacts as a result of cumulative factors expected from the proposal. Local populations could experience moderate impacts.

Herring: Herring have been reported in nearly every bay on the west side of Kodiak Island (Blackburn, 1980). These herring may be affected by activity on the Cook Inlet/Shelikof Strait area, but not by activity in the Kodiak Planning Area. Effects on Kodiak area herring are assessed further in Section IV.B.13.

Groundfish: The estimated level of exploration (12 wells in 5 years) and production (1 platform) activity and the limited radius of effects would result in very low effects on groundfish. Diluted discharges of formation waters and drilling muds and cuttings from offshore locations in the planning area could have a low effect on adult groundfish using deep water areas. An offshore oil spill (26% chance of 1 over 1,000 barrels) which did not contact nearshore areas would contact nearshore areas would result in limited mortality.

Groundfish are generally less susceptible to hydrocarbons than pelagic fish, as reviewed in Section IV.B.11.a.(2)(c). The limited areal extent of even a major oil spill could result in only a low effect on groundfish populations. An oil spill (one estimated) which contacted nearshore areas being used by concentrations of groundfish could result in a moderate effect on groundfish species depending on the portion of a population present, the areal extent of the spill, the concentration of hydrocarbons, and the length of exposure. Reduced stocks of halibut and sablefish could be particularly vulnerable and could experience moderate effects. There is, however, a relatively low probability (27%) of an oil spill resulting from this proposal.

Only a major oil spill which contacted and exposed nearshore areas to lethal concentrations of hydrocarbons when vulnerable life stages were concentrated in those areas is expected to produce a moderate effect on a portion of a regional Kodiak population.

Given the extensive distributions and numbers of groundfish in the Kodiak area, the localized effects resulting from this proposal are not expected to result in a change in regional populations, and should result in a low overall effect.

CONCLUSION: Impacts of this proposal on regional Kodiak populations of groundfish are expected to be low. Local populations could experience moderate impacts.

CUMULATIVE IMPACTS: Activities which may produce cumulative effects on groundfish include other Federal and State ongoing and proposed hydrocarbon development, commercial fishing operations, and other non-petroleum industry activities. Tankering from existing leases and the proposal in the Gulf of Alaska region and the Bering Sea is not expected to increase effects discussed for the proposal, since these tankers are not likely to pass near the planning area. Cumulative spill effects tend to increase mainly in locations where tanker traffic may be concentrated (Hinchinbrook Entrance, Unimak Pass).

CONCLUSION: Groundfish in the Kodiak area are expected to experience low impacts. Local populations may experience moderate impacts.

Crab: The estimated level of exploration (10 wells in 5 years) and production (1 platform) activity and the limited radius of effects would result in very low effects on crab. Diluted discharges of formation waters (250 million barrels) and drilling muds, and cuttings (about 840 thousand barrels in 35 years) from the offshore locations in the planning area might cause lethal or sublethal effects on crab. These discharges, however, will affect only a small portion of the widespread larval drift populations, and could result in low effects on regional crab populations. The one assumed offshore oil spill (over 1,000) if it did not contact important nearshore areas would still result in mortality and could result in a low effect on crab populations. Crabs are affected by hydrocarbons, as discussed in Section IV.D11.b(2)(d).

Only a major oil spill which contacted and exposed nearshore areas to lethal concentrations of hydrocarbons when vulnerable life stages were concentrated in those areas is expected to produce a moderate effect on a portion of a regional population.

Given the extensive distributions and numbers of crabs in the Kodiak area, the localized impacts resulting from this proposal are not expected to result in a change in regional populations and should result in a low overall effect. If an oil spill were to contact a nearshore area inhabited by breeding adults, moderate effects could result.

CONCLUSION: Impacts of this proposal on regional populations of crab are expected to be low. Local populations could experience a moderate impact.

CUMULATIVE IMPACTS: Activities which may produce cumulative effects on crab include other Federal and State ongoing and proposed hydrocarbon development, commercial fishing operations, and other nonpetroleum industry activities. Tankering from existing leases and the proposal in the Gulf of Alaska region and Bering Sea is not expected to increase effects discussed for the proposal. Cumulative spill effects tend to increase mainly at locations where tanker traffic may be concentrated (Hinchenbrook Entrance, Unimak Pass).

CONCLUSION: This proposal could result in low impacts on the regional population of crabs. Local populations may experience moderate impacts.

(c) Impact on Marine Mammals

Ten species of nonendangered marine mammals -- Pacific harbor seal, Steller sea lion, northern fur seal, sea otter, killer whale, harbor porpoise, Dall's porpoise, minke whale, beluga whale, and Pacific white-sided dolphin--commonly occur in a portion of or throughout the Kodiak Planning Area and are very likely to have some interaction with OCS activities. Oil pollution (one expected spill over 1000 barrels) (10 exploritory wells, one production platform and one onshore facility) and disturbance due to increased human activity could adversely affect marine mammal populations found in the planning area. The general effects of oil spills, noise and disturbance, and habitat alterations on marine mammals are discussed in Section IV D 1.a.(4)(c), Impacts on Marine Mammals in the Gulf of Alaska Planning Area.

Over 6,000 sea otters occurring around Afognak, Barren, northern Kodiak, and Trinity Island are the marine mammal populations at greatest risk from the one assumed oil spill associated with OCS activities in the Kodiak Planning Area. If an oil spill occurred and contacted one of the above sea otter concentration areas, several thousand sea otters may be killed, representing a moderate effect on the population.

Large numbers of sea lions and harbor seals could become contaminated if a spill contacted the Barren Islands, Marmot Island, Tugidak Island or other important rookeries or haul out areas in the planning area. Harbor seals and sea lions probably would not suffer high mortalities from oil spill contact with only weak individuals and perhaps young pups suffering serious effects. Oil spills are likely to cause low effects on harbor seal and sea lion populations.

The northern fur seal is also likely to suffer no more than low oil spill effects from even a large spill in the Kodiak Planning Area because fur seals are widely distributed along their migration route during spring and fall migrations with animals swimming through the area in small groups and not in large herds. The migration through the planning area also occurs over several weeks; thus, large numbers of fur seals are not likely to come in contact with even a large oil spill which would become highly weathered and dispersed within ten days of the spill release. Although cetaceans could be exposed to an oil spill or gas condensates on the water surface or in the water column only highly stressed individuals could possibly suffer serious sublethal effects (see discussion of generic effects under Sec IV D 1.a.(4) (c)) from the probable, very brief exposure to concentrated hydrocarbons; thus oil spill effects on cetaceans in the Kodiak Planning Area are likely to be very low.

Harbor seals inhabiting major breeding and haulout habitats on Tugidak, Chirikof, Afognak, Kodiak and the Barren Islands could be exposed to some noise and disturbance from the helicopter and support-vessel centered out the one or two onshore support or development facilities. Sea lions breeding on the Barren, Marmot, Chirikof Islands may be disturbed by some aircraft overflights. However, noise and disturbance from aircraft and vessel traffic would be very transitory and brief in duration. The frequency of disturbance is likely to be low because of the small amount of activities, and of little apparent consequence, unless pupping activities are disrupted. Disturbance of harbor seal and sea lion rookeries during the pupping season could significantly reduce pup survival. However, the Marine Mammal Protection Act and existing regulations could help to prevent excessive disturbance of harbor seals and other marine mammals. Thus, overall levels of disturbance effects are likely to be low.

Noise and disturbance from air and boat traffic and seismic-geophysical exploration activities associated with offshore oil and gas activities in the Kodiak Planning Area could cause brief startle, annoyance, and/or flight responses of whales, dolphins, and porpoises. However, present knowledge on cetaceans behavior in association with industrial noise sources suggests that effects of disturbance on nonendangered cetaceans are likely to be very low. Construction activities associated with the proposal (installation of the one oil and gas platform, two and up to offshore pipelines) are likely to have short-term or very low effects on marine mammals and their habitats, with any avoidance of drill platform sites (12 exploratory platforms in 5 years) or pipeline routes by whales or other marine mammals subsiding after construction activities are complete.

CONCLUSION: The proposal could have moderate effects on sea otters, low impacts on pinniped populations, and very low impacts on nonendangered cetaceans.

CUMULATIVE IMPACTS: The additive effects of other ongoing and planned projects, as well as the proposal on nonendangered marine mammals occurring in the Kodiak Planning Area and the Gulf of Alaska are discussed in Section IV.D 1.a.(4) (c). Impacts on Marine Mammals in the Gulf of Alaska Planning Area. A summary of these effects are as follows. Oil spills that may be associated with cumulative oil and gas activities and other marine traffic could have moderate effects on sea otters and possibly fur seals, and low effects on other pinniped populations, and very low effects on cetacean populations. Noise and disturbance from cumulative air and vessel traffic, and increased human presence associated oil activities and other development projects could have moderate cumulative effects on harbor seals or sea lions if important rookeries were frequently disturbed while cumulative disturbance effects on other marine mammal populations are likely to be low. Cumulative changes in prey-food source abundance and distribution due primarily commercial fishing particularily if bottom fisheries for demersal fin fish increase, could have moderate effects on some marine mammal populations. The overall cumulative impact from these above projects on marine mammals could be moderate; however, the proposal above is likely to have no more than moderate effects on sea otters and other pinnipeds, and low to very low effects on nonendangered cetaceans. However, oil spill estimates (1 major spill over 1,000 barrels) and other impact causing factors, number of exploratory wells (24) and production platforms (2) approximate the proposal and therefore should not increase impact levels.

CONCLUSION: The proposal with existing activities is likely to have no more than moderate impacts on sea otters and pinnipeds, and low impacts on nonendangered cetaceans.

(d) Impact on Coastal and Marine Birds

The effects of an oil spill (one spill over 1000 barrels estimated) on birds would vary with season, duration, volume, and composition. Winter spills in the Kodiak Island area could affect overwintering ducks and crested auklets, loons, grebes, cormorants, seaducks, eagles, gulls, and alcids which are year-round residents. In addition to the year-round residents, fulmars, shearwaters, storm petrels, geese, dabbling ducks, shorebirds, and alcids could be affected by a summer spill. Ducks, geese, shorebirds, and alcids would be the groups most adversely affected by a spill during spring and fall migration. Embayments containing marshes and nearshore areas where prey organisms are concentrated are the most vulnerable habitats.

In the Barren, Afognak, and Kodiak Island areas common murres, tufted puffins, and fork-tailed storm petrels and the greater majority of the marine wintering species are among the most vulnerable to oil pollution. Sensitive marine bird populations that occur in this area would be at risk from oil and gas development (12 explorations wells and one production platform). Large nesting colonies of vulnerable species may be affected by an oil spill that reaches the island or occur within important nearshore concentration areas. Tens of thousands of shearwaters that concentrate in these areas during spring could also be adversely affected directly and indirectly by an oil spill. Highly vulnerable sea ducks and alcids that winter in the bays of the Shelikof/Kodiak Island area are likely to suffer high effects, especially during the winter and fall.

If the assumed oil spill (27% probability) occurs in the Kupreanof Strait or Whale Passage areas, effects to marine birds are likely to occur, since this area is an important year-round concentration area in the Kodiak-Lower Cook Inlet region.

Chronic small oil spills are the most likely spills and inevitable in occurrence to a certain degree. Such spills are most likely to be a problem near shore facilities (one estimated) and along tanker routes. Even small quantities of chronic oil discharges in addition to accidental discharges, if they occur in an important marine bird concentration area, could have a detrimental effect on marine birds that utilize the area.

Numerous sea bird colonies and waterfowl populations could be affected by increased air and boat traffic during drilling activities from the 12 exploratory wells and construction of one production platform. Large sea bird colonies in the Barren Islands area and waterfowl populations on Afognak and Kodiak Islands could be subject to this additional traffic which may lead to reduced productivity and population reductions. Tufted puffins are one of the more sensitive marine birds to human disturbance and are easily panicked by low flying aircraft near their burrow nests. Frequent human disturbance of this species during the nesting season would reduce reproductive success.

Kittiwakes and murres are also sensitive to low flying aircraft and may leave the cliff colonies in mass. The responsive increase in gull populations to human development, and to associated increases in waste and garbage disposal sites could have a significant adverse effect on other marine bird species.

Depending on the location, size, and season, the one assumed oil spill could impact thousands and perhaps several hundred thousand marine and coastal birds. Such a spill could result in high effects on bird populations in the Kodiak/Barren Island area, but it is not likely. There is, however, only a 27% chance of a spill occurring.

CONCLUSION: Impacts to regional populations would be moderate. Impacts to local populations could be high.

CUMULATIVE IMPACTS: While many sea birds do not undertake extensive migration, some do migrate through or overwinter in or near other lease areas and therefore are subject to an increased oilspill risk. Most waterfowl and shorebirds are highly migratory, and thus likely to migrate through, overwinter in, or breed near other State and Federal lease areas. Spills and/or disturbance which adversely affect breeding stocks of certain sea bird species at more than one major colony also could result in a reduction of their regional populations. However, the cumulative spill rate is the same as the proposal (one over 1,000 barrels). Cumulative exploration and production facilities appoximate the proposal.

Other factors which may make a substantial contribution to cumulative effects include mortality resulting from birds accidentally captured in salmon driftnets, the long-term effects of habitat degradation/disturbance, and possible alteration or reduction of prey species populations. A combination of such factors could result in a decline in regional sea bird populations.

CONCLUSION: Regional marine and coastal bird populations could experience moderate impacts as a result of cumulative factors. Local impacts could be high.

(e) Impact on Endangered and Threatened Species

Endangered species known to occur in or adjacent to the planning area include the blue, sei, sperm, gray, humpback, fin and right whales, the Aleutian Canada goose and the short-tailed albatross. Neither the peregrine falcon nor any listed plant species occur in the areas adjacent to the planning area. Refer to Section IV B 11.a.(4) (e) in this document and Sale 88 FEIS for more specific details on potential effects on endangered and threatened species that may occur as a result of oil and gas activities in the Kodiak Planning Area. Because there have been no proposed sales in the Kodiak Planning Area recently, there have been no endangered species consultations.

There is a 5% marginal probability of discovering the 95 MMbbls of oil speculated to be in this area. It is expected that up to 12 exploratory and delineation wells will be drilled over five years and up to 42 development/production wells will be drilled from one platform over the life of the field (35 years). During this time period one oil spill over 1000 is assumed to occur. If a spill occurs in the Albatross or Portlock Bank areas during the spring or summer months, all seven species of whales could be affected by either direct contact or indirect contact of prey organisms Fouling of prey organisms or feeding mechanisms are likely to result in short term effects to whales. Aleutian Canada geese migrate directly from nesting areas to overwintering areas. Since they do not rest on the water during overwater migration they would be unaffected by oil slicks. If short-tailed albatross were to land on oiled water effects would be the same as those described for marine birds (Section IV B 11.a.(4) (d). Oil spills are likely to affect localized areas for a short time.

Noise disturbance associated with the oil and gas activities such as seismic vessels (low and high resolution) and vessel, and air support traffic and drilling and construction activities could affect whales. Any activity that ensonifies an area to higher levels and broader ranges is likely to disrupt normal whale activities. Reactions by whales could range from no observable reactions to abandonment of the ensonofied area. Noise activities occurring in whale high-use areas pose the potential for the greatest disturbances. Noise producing activities are most likely to occur in localized areas such as an exploration well site or production location for the duration of the season for the noise to start up. Noise levels generally may be below harmful levels beyond a short distance from the source. Although not documented in all cases, it is possible that whales may become accustomed to nonthreatening noise sources associated with oil and gas activities.

Areas of high whale use include the seashore areas of eastern Kodiak Island, the Albatross, and Portlock Banks. Oil and gas activities located in these areas pose the highest potential to disturb endangered species. Gray whales pass through this area during the spring and fall migrations. Some feeding in this area can be expected during the migration. All other whale species will be in the area (except for winter) feeding, raising young and possibly breeding. The Albatross and Portlock Banks are a preferred feeding area.

Endangered species are widely distributed throughout the planning area, and therefore, the probability of interaction with oil and gas activities (low probability of discovery - 5%) are decreased. The one production/development platform and surrounding area is small in comparison to the entire whale use of the planning area so that negative interactions will probably be limited to a localized area which whales may learn to avoid entirely.

CONCLUSION: Impacts of oil and gas activities associated with the proposal are expected to be low for whales and very low for birds.

CUMULATIVE IMPACTS: Cumulative effects are of concern especially for those species which migrate through many of the planning areas. Whales whose primary summer use area is the northeast portion of the Pacific Ocean (humpbacks, fin, right, sei, blue) will be exposed to up to two development/production platforms. The proposal is assumed to add one oil spill over 1000 barrels. These platforms associated noise producing activities will be widely separated from each other (one per planning area). Tankering of oil to market should not expose whales to noise levels greater than those from tankers traveling between Valdez and southern markets. The routes will probably be different except along the coast of Canada. Reactions to increased numbers of tankers probably will be no different from whale activities observed along current tanker routes. The additional number of oil spills in the Gulf of Alaska region whales could be exposed to may alter migration routes or feeding areas until the toxic components of the oil spill reach ambient levels. The presence of oil and gas activities in this area (where none currently occur) will increase risks to endangered species from oil spills and noise disturbance, either of which may result in habitat alterations. However, activities are not expected to affect fecundity or preclude a successful feeding season on a long-term basis.

CONCLUSION: Impacts on endangered and threatened species are estimated to be low.

(f) Impact on Estuaries and Wetlands

The topics are discussed and impacts analysed where they occur as habitat for the fish and wildlife species in (4)(a) through (4) (5) in this section.

(g) Impact on Areas of Special Concern

These areas are all habitat for the fish and wildlife species in (4)(a) though (4)(5) and impacts are discussed as they occur in the planning areas.

(h) Impact on Marine Sanctuatires

There are no marine sanctuaries in the Alaska OCS Region.

(5) Socioeconomic Environment

(a) Impacts on Employment and Demographic Conditions

For detailed discussion on employment and demographic conditions see the Western Gulf of Alaska (Kodiak) (Sale 46) DEIS (USDOI, MMS, 1980) and Gulf of Alaska/Cook Inlet (Sale 88) FEIS (USDOI, MMS, 1984).

The search for and discovery of oil and gas within the Kodiak planning area could create employment opportunities and consequently increase population levels. These changes have both positive and negative attributes, thereby giving an indication of the socioenconomic well being of communities the State or regions with the State.

This proposal could generate a region wide total of about 400 jobs during peak activity. This is based on estimates made in past EIS's for the Alaska OCS Region for similar activities in similar areas. The bulk of the jobs (perhaps 90%) will be filled by workers living in enclaves near the job site.

The general pattern is one of small employment effects in the exploration phase and fairly large effects during the development phase (starting in 2001) with most jobs in both exploration and development phases filled by commuters living in the petroleum industry enclave. By contrast, it is expected that the moderate number of new jobs created during the production phase (starting in 2006) would be filled somewhat by permanent residents of a community within or near the planning area.

A State wide peak population increase of about 270 persons could be associated with the projected employment increase. Of that number a small portion may live in a small town or village associated with development activity. The bulk of the new population (family of enclave living workers) could live in Anchorage. The Matanuska Valley or on the Kenai Peninsula.

Impacts are potentially more significant in those areas of small present populations near which offshore-related activities may be located.

For the Kodiak Planning Area, Kodiak city is the town that may be affected. Because of the small number of new jobs and population anticipated impacts are expected to be low on a regional basis. Impacts at Kodiak could be moderate during an influx of population depending on timing and duration.

CONCLUSION: The population increases resulting from offshore activities would have a low effect on Kodiak's employment and population.

CUMULATIVE IMPACTS: Because of the very small increases in resident-population levels, cumulative effects would be essentially the same as those of the base case.

Community growth anticipated in Kodiak would generally have a moderate effect on the city's infrastructure. Growth in the residental sector anticipated by the year 2010 would necessitate facility expansion and personnel increases for the educational, healthcare, lawenforcements, and fire protection systems to maintain adequate service levels. Recent expansions to the electrical power, water-supply, and sewage treatment facilities should be sufficient to meet community needs through the year 2010. However, a continuing construction program would be necessary to connect new residential areas with these services. Additional information on the ability of each service to accommodate projected population growth can be found the Gulf of Alaska Cook Inlet (Sale 88) FEIS (USDOI), MMS, 1984).

Cumulative effects of Federal oil and gas development in the Kodiak Region plus the State generated activities could substantially increase regional employment and populations. Because of the size of Alaskan planning areas and the wide distances between coasal villages, local employment and population growth will more nearly follow estimated employment and population growth figures for the planning area rather than experienced much growth on a cumulative basis.

CONCLUSION: Cumulative employment and subsequent population growth will be moderate.

(b) Impact on Coastal Land Use

The search for and discovery of oil and gas in the Kodiak Planning Area will affect coastal land use. There will be direct demands for land needed to explore, develop, produce, and transport hydrocarbon reserves if discovered. There will also be secondary demands for land from the induced population. It is assumed that the majority of activities in the exploration and development of hydrocarbons will occur in the private land market and will be primarily concerned with the mix of commercial, industrial, and residential land. At the Federal and State regional level the absolute ownership changes will be small. However, it is possible that demands for the land to satisfy production and trans-shipment could occur on these lands.

At the community level the ownership changes during the exploration stage could be significant, especially in the relative sense. The village nearest the development or the one being used for support and supply could experience large ownership changes. In the Kodiak Planning Area, Kodiak city is the village most likely affected.

Small absolute changes in the ownership patterns of key community services or areas could be large in the communities' view (oil and gas concerns buying or leasing land and capital improvements to support their activities). Induced populations could increase demands and changes in land ownership, especially in residential area demands for space. If these ownership changes take place, they will, however, diversify the economic base of a preponderantly fishing economy and increase the tax base of the community.

Impacts from siting of facilities (one onshore estimate) will be both long- and short-term, depending on the activity involved. Onshore pipeline construction (up to two landfalls) will be a short-term impact. Blasting, trenching, vehicle emission, earth removal, etc., will result in short-term disruption of the terrain, vegetation, and wildlife. There are also conflicts caused by the temporary presence of noise, odor, and visual degradations. After emplacement, the earth removed in the operation will be replaced. It is assumed the vegetation will reestablish itself and that the construction site will assume a near normal appearance.

Development and use of support facilities would have a long term (35 years) impact on land use. By support facilities is meant a wide variety of supply and service industries having capabilities to support the exploration, production, and transportation of gas and oil.

An operating base of support provides facilities for air and marine transportation, office and warehouse space, maintenance, and radio equipment. The increased vessel and air traffic into these areas will exert pressures on existing airfields and docking facilities.

In addition to the direct demands for land resulting from offshore production in the Kodiak Planning Area certain secondary effects would result. As induced population moves into existing or new communities, they will create a demand for residential, commerical, public, and quasi-public and open space lands. These demands may encroach on existing land configurations and, in some cases, require changes in land use patterns. As previous projections have inferred, the preponderant demand for land for both housing and supportive services, will center in the Anchorage, Matanuska Valley and Kenai Peninsula areas. However, even a smaller community such as Kodiak could have a large relative impact to existing land patterns within these areas.

In the Kodiak Planning Area it is expected that one marine support and supply base will be needed and one air support base. There could be two onshore pipline land fall and one oil and gas shipping terminal.

Currently land uses in the Kodiak Planning Area are primarily devoted to recreational, subsistance and in some places residential use. Large scale industrial facilities are foreign to the area given that facilities could be designed to accomodate the restrictions which may be attached to a particular location. Effects would probably be moderate for most potential industrial sites.

CONCLUSION: Overall effects would probably be moderate.

CUMULATIVE IMPACTS: Adequate industrial and residential lands are available in Kodiak city to accomodate growth projected for the proposal. Cummulative effects within the state's coastal area arising from increased fishing, tourism and additional oil and gas activity could accentuate slightly the potential conflicts with coastal management policies noted for the proposal, especially in the vicinity of Kodiak Island Borough. As the planning area should be the site of no more than one processing facility as a result of the proposed schedule, overall effects should remain moderate.

CONCLUSION: Impacts are estimated to be moderate.

(c) Impact on Commercial Fisheries

The commercial fisheries of the Kodiak Planning Area are of three political-economic designations: (1) domestic, (2) foreign, and (3) joint-venture. Together these operations harvested (1980), 8.2 percent of the total fish catch from all U.S. waters. The Gulf of Alaska catch which includes the Kodiak, Cook Inlet, and Shumagin Planning Areas accounted for 40 percent of the total Alaska catch by U.S. fishermen, and about 15 percent of the foreign fleets, Alaskan waters catch. Domestic Kodiak fisheries are mostly coastal. There are distinct fisheries for dungeness crab, king crab, tanner crab, shrimp, scallops, salmon, herring, and halibut. Each fishery has its own set of regulations. Salmon dominate harvests in the Kodiak Area with pinks forming the bulk of the catch. Herring, halibut, sablefish, crab, and shrimp are also fished. Shellfish follow in order of magnitude and value, then herring and halibut.

Oil exploration and development in the region, including seismic surveys, could affect the commercial fisheries in the following ways: (1) oil spills (one over 1000 barrels estimated) could damage the fisheries resources; (2) fishing gear could be lost or damaged, and there would be related lost fishing time; (3) and there could be displacement from fishing areas (only one production platform estimated) and possibly from harbors or other onshore space.

Oilspill effects on all commercial species are expected to be very low. This is due to the low number of spills projected over the 35 year life of the field (1 for spills of 1,000 barrels or greater); the remote probabilities of spills (27%) occurring when vulnerable early life stages are present; the very low probabilities that a large spill would occur and contact nearshore areas used by salmon, herring, and shellfish species; and the generally low concentrations of dissolved hydrocarbons expected to be associated with a marine oil spill. Therefore, effects on the commercial fishing industry as a result of direct harvest losses due to oilspill mortality are also expected to be very low.

The fishing gear loss problem is primarily during the exploratory phase, (12 exploratory wells in 5 years) in that seismic vessels (unknown number) and fishing gear try to occupy the same space, many time to the detriment of both industries. The crab fishing industry is most affected because crab pot float lines could be cut or tangled in seismic gear and fishermen then could lose the pots and the crab contained in them.

In early summer 1983, representatives of both industries met to resolve this and other oil-fishermen problems. The result has been a "Manual for Geophysical Operations in Fishing Areas of Alaska" developed by a committee formed from personnel of both industries. A standing committee has been formed to maintain working contact and update the manual. This has gone far in resolving effects assessed to this activity.

The potential effects of oil spills on the commercial fishing industry are difficult to quantify because of the several variables involved; not the least of these is the seasonal and often transient nature of the fisheries. The intensively fished and relatively small coastal areas are the fishing areas that would be most likely to be affected by an oil spill of 1,000 barrels or more originating at these general locals.

It is possible for an oil spill to impinge on a fishing area or areas. Further analyses, however, find low percentages modified by the relatively limited area subject to contact, and also the usual limited fishing periods and seasons.

Whether commercial fishing would be affected by a spill because of this proposal is indeterminate due to the seasonal nature of the fisheries and changes in fishing areas.

Kodiak Island fishing areas could be affected by oil development, principally through a large oil spill of some duration polluting critical nearshore fisheries habitat and more so, during the early pelagic life (egg and larval) stage. However, the analysis in the Section on Fish Resources concludes that there would be only low impacts on populations supporting commercial fisheries.

Commercial fishing might also be adversely affected by an oil spill fouling fishing gear and/or flavor/tainting its catch and concurrent lost fishing time. The fishing industry could be compensated for these losses through the provisions of the Offshore Oil Pollution Compensation Fund (33 CFR, Paris 135136). A self-replenishing fund of $100,000 for each OCS area has been established; however, claims are not limited to this amount. Regulations now in effect have reduced the former overly long claim-processing time. For details regarding this fund, see Alaska OCS Technical Paper No. 4 (Casey, 1981).

Lost fishing time in the Kodiak Island areas may result from the time required to replace or clean and repair oil-fouled gear. Lost fishing area could result from placement of structures, including pipelines, in fishing areas-especially where trawl fleets operate--and oil development might also interfere with fishing vessel traffic.

To date, onshore construction projects (4) related to offshore oil-and-gas exploration and development (14 production platforms) in the Cook Inlet region have had minor effect on the fishing industry. The workforce for oil-and-gas development has largely come from outside the fishing industry, and this is expected to continue so long as income derived from fishing remains at current levels.

Secondary effects on the fishing industry would be loss of fixed gear and crab pots as a result of oil industry marine traffic. The recent formation of an Oil/Fisherman Group will go far in reducing these effects.

Loss of fishing area through the presence of offshore platforms (one anticipated) and pipeline (two anticipated) is assessed as low. It is assumed that 12 exploratory wells would be drilled in the Kodiak Area, over 5 years and that one exploratory platform would be used. If one platform would preempt a 1,000-meter radius around the platform from any fishing activity; then approximately 6.3 to 19 square kilometers (exploration if three wells are drilled at the same time) would be preempted at any one time in the entire lease sale area during exploration. If the same assumption is used for the one development platform, then approximately 6.3 square kilometers would be preempted. If trawlers avoided pipelines using a 500-meter buffer on either side of the pipeline, then about 5.0 square kilometers would be lost to fishing. Therefore, the total area that could be lost to trawling for pelagic and demersal fish (groundfish) would be 6.3 to 19 square kilometers during exploration and 56.3 square kilometers during development and production. Since this represents a small area relative to the large area used by both foreign and domestic trawlers in this region, only low effect to commercial fisherman is expected, even if harvest losses were conservatively estimated as being proportionate to the total area preempted.

The gear loss problem may be solved by space allocation of fairways for oil industry vessels, including tankers. This has already been done for Alyeska Pipeline oil-tanker traffic in Prince William Sound. In addition, a recent "Manual for Geophysical Operations in Fishing Areas in Alaska," prepared by a joint fishing industry/oil industry group, could help alleviate potential conflicts.

Oil development, by bringing more air and vessel traffic into the area, will provide safety and other benefits to fishermen in the form of better communications, increased air sea rescue capabilities, and more commercial amenities in port communities. At the same time, increased air and vessel traffic may decrease safety by increasing the probability of vessel collisions, to an indeterminate degree. At present, most vessel collisions occur in restricted area (bays and harbors) during times of limited visibility. The incidence is very low, and the oil vessel increment should not appreciably increase this already low rate. Analysis of the potential for collisions by Centaur Associates, Inc., under contract to the Minerals Management Service, indicates a collision rate in the open ocean, in ports, and in transit of less than one per year for 20 years for all areas of Bering Sea oil-and-gas development (Bering Sea Commercial Fishing Impact Analysis, Alaska OCS Social and Economic Studies Program Draft, Centaur Associates, Inc., 1983). It is assumed that collision rates could be similar in the Kodiak area.

CONCLUSION: Impacts on the regional fishing industry from the proposed action would be low.

CUMULATIVE IMPACTS: Other Federal lease sales off the Alaskan coast could impact the fishing industry in the Kodiak Island area. The principal effect would result from an unknown amount of tanker traffic in transit through this lease area. State oil and gas lease sales in upper Cook Inlet would maintain the present rate of tanker traffic through the area for a longer (up to 20 plus years) time. Additional discoveries of oil from the Prudhoe Bay/Beaufort Sea area would maintain present tanker traffic levels from Valdez through the area for many years. However, most of this tanker traffic (Bering Sea and Valdez would not effect the Kodiak area. Only one spill over 1000 barrels is anticipated which is the same as the proposal. An increase in U.S. groundfishing (up to 40 boats in Kodiak) could increase traffic effects in the future.

Vessel traffic other than oil and gas related transport is projected to increase somewhat in the lease area as the population of Alaska increases. The effect of these continuing or increasing transportation efforts could cause conflicts between fishing vessels and other ships and could affect docking, harbor, and supply needs. However no more terminal sites are anticipated and only one more platform is estimated for the cumulative case.

CONCLUSION: The cumulative effect on the regional commercial fishing industry is expected to remain low, as for the proposal.

(d) Impact on Recreation and Tourism

Most effects on recreation and tourism would be changes numbers of users, property values and visual qualities. There is expected to be a small population increase in the Anchorage area (270 people) due to proposed exploration and development activities. This increase in users of recreational resources would not place serious stress on the visual qualities and property values in a local area for any long period of time. Visual qualities would be changed in this pristine area by the appearance of one oil platform if it is within the 12-mile zone of a recreational area. A gas flare at night would also be visible at such distances. These changes in visual quality would be local and would extend only for short periods of high activity (such as drilling and pipelaying) over the duration of the lease. Construction activities in wilderness like areas would temporarily disrupt the character of these areas. The Kodiak lease area is expected to produce 95 million bbls of oil and 1840 billion cubic feet of gas. The probability of hydrocarbons is 0.05.

Use of recreational land by proposal related activities will be minimal. Increased population in the Kodiak Planning area will also be small. The bulk of new population (270 people) will be concentrated in the Anchorage, Matanuska Valley and Kenai Peninsula areas.

CONCLUSION: Effects on recreation and tourism are low.

CUMULATIVE IMPACT: Effects on recreation and tourism are caused by increased population and access caused by Federal and State oil and gas leasing activities, other projects that may take place and the increased emphasis placed by the State and tourism. The sheer size of the Kodiak region, its present space population and access and the very low level of proposal major program will tend to keep cumulative impacts low.

CONCLUSION: Cumulative effects would be low.

(e) Impact on Archaeological resources

Effects on archaeological resources would result from disturbance to underwater landforms, shipwrecks, and historic sites. Onshore prehistoric and historic sites may be affected by increases in industrial populations which in visiting such sites could accidently disturb them. Effects are similar to those given in the Sale 60 FEIS (USDOI, MMS, 1981). The onshore archaeological resources in the planning area may be directly, adversely affected if the one assumed spill over 1000 barrels reaches the shoreline. Onshore sites could be adversely affected by construction activities, industrialization, (one onshore facility) increased population (low) in the area, and changes in land use status. The Kodiak planning area is expected to produce 95 million bbls. of oil and 1840 billion cubic feet of gas. The probability of hydrocarbons is 0.05. Based on these figures one spill greater than 1000 barrels is assumed to occur during the lease period.

Over 100 Unique cultural or historical resources exist within the area and some may be disturbed, resulting in minimal loss of data, Disturbance factors are low because of the low level of activity. There are also nonunique cultural or historical resources which may be contacted or disturbed, resulting in loss of data which may be equally obtainable from other sources. Due to the anticipated low level of disturbance factors coupled with the low probability of interaction between oil and gas development activities and archaeological resources, the effects are expected to be low.

CONCLUSION: Effects on archaeological resources are low.

CUMULATIVE IMPACT: The major actions affecting archaeological resources are the activities associated with federal and state oil and gas lease sales. The cumulative effects of other private, state and federal projects, to gether with the proposal, result in an unlikely chance of interaction with archaeological resources.

CONCLUSION: The cumulative effects expected to be low.

(f) Impact on Transportation Systems

It is assumed that marine and air support for offshore petroleum development activities would issue primarily the Kodiak Island. Industry would probably choose to construct a separate marine facility dedicated to petroleum support activities. Sufficient acreage exists on Kodiak Island. Traffic from and to the marine support base would not constitute a navigational hazard. In regard to air traffic, the Kodiak airfield is currently operating below capacity and should easily facilitate all traffic related to offshore drilling and production. Some construction; however, next to the airfield for dormitory and warehouse facilities would be necessary. Production facilities could be located on Kodiak Island; also most of the Island is devoid of infrastructure, all requirements for petroleum storage/shipment as well as gas liquefaction would have to be constructed on site. Traffic from the terminal would be minimal; possibly once every 10 days to two weeks at the peak of production activities. Thus, the potential for marine traffic conflicts is expected to be low.

CONCLUSION: Effects of the proposed action are expected to be low.

CUMULATIVE IMPACTS: Kodiak Island could be expected to be the support site for only one sale during the subsequent five years; the cumulative effects are not expected to exceed the level forecast for the proposed action.

CONCLUSION: Cumulative effects are expected to be low.

(h) Impact on Subsistence-Use Patterns

For discussion of impacts on subsistence-use patterns, see the Western Gulf of Alaska (Kodiak) (Sale 46) DEIS (USDOI, MMS, 1980) and Gulf of Alaska/Cook Inlet (Sale 88) FEIS (USDOI, MMS, 1984). At one time, the natives of the Kodiak planning area used to get virtually all of their food from subsistence. Even in the early 1960 most were still getting about 80 percent this way, but by 1975 a maximum of only 40 - 50 percent of the food was obtained by subsistence activities. The decline has been related to increased job opportunities, increased welfare and food stamp payments, and increased competition for the limited biological resources by both the increasing number of local and non-local hunters and fishermen.

Subsistence food items in the Kodiak area consists mainly of salmon and other seafood. Other subsistence items are dee, harbor seals and seal oil, waterfowl, marine invertebrates, seaweed, berries, and greens.

Oil development and production activities although small (one production platform) could adversely affect populations of coastal fish species that live all or any part of their life in the area. The primary impact would be on egg, larval, and fry stages of the fishery resource.

Salmon could be affected during most of their life stages because pollutants from oil-related activities would adversely affect the young, could cause avoidance of spawning areas, or reduce the food supply needed for optimum survival of the species.

Natives generally harvest only harbor seals as part of their subsistence requirements. Harbor seals could be affected by oil contamination of pupping rookeries and by the elimination of traditional hauling grounds and rookeries through human construction or disturbance activities. Only one pipeline land falls and one shipping terminal is estimated. Although the potential exists for a decrease in the population level of harbor seals and the elimination of traditonal hauling ground (and concomitant hunting areas), the significance of this impact would depend on the location of oiling and construction activities, time period, and the number of successive oilings.

Deer utilize coastal beaches for foraging or transportation and are remotely susceptible to becoming oild and/or ingesting oil. The significance and magnitude of oil contamination on terrestrial wildlife would depend on the location and extent of contaminated beaches and season of the year.

The impact of any increase in human population, i.e., hunters, which might result from this proposal could have a more significant impact on deer populations and/or length of the hunting season than any possible oiling of beaches, or direct habitat encroachment. At the present time deer population levels are high, healthy and any future increase in hunter harvest is expected to enhance herd productivity and vigor.

Subsistence data tends to indicate that as the population of an area grows, the per capita subsistence harvest grows less due, in part, to the competition for limited biological resources. Growth in population would tend to further reduce the subsistence way of life in Kodiak Island communities.

Local population growth will be low because of activities from this proposal. The one termianl shipment center may not be anywhere near a village and if it is most of the workers will live in enclaves. The low level onshore facility attributed to this proposal will tend to reduce the opportunity to impact subsistances use.

CONCLUSION: The overall effect on subsistence in the planning area would be low.

CUMULATIVE IMPACTS: Increased tankering of crude oil from Cook Inlet, could increase the threat of oil spills on the subsistence resources used by the residents of the planning area. The cumulative case for Kodiak increase the production platforms in two and exploratory wells to 24. Resource increase though are not enough to increase the number of spills.

Only a marginal increase in oilspill risk to subsistence resources would be expected from the proposal. There should be little increase in land based activities and subsistence resources or their habitat.

CONCLUSION: The cumulative effect of oil spills and other industry activities could result in low effects on subsistence in the planning area.

(i) Impact on Sociocultural Systems

Shelikof Strait exploratory drilling to the west of the Kodiak planning area has already affected attitudes toward OCS on the part of Kodiak Island and communities, showing a lessening of opposition. (Cultural Dynamics, 1985). Probable oil recovery is projected as very small for this area. Sociocultural effects should be very low. See also the Cook Inlet/Gulf of Alaska FEIS, USDOI, 1984. The bulk (90 + %) of new residents attributed to this proposal will reside in areas outside of the Kodiak planning area. The demand for facilites and services required by this small population would be negligible. The demand on electrical-power, water, and sewage-treatment facilities would constitute less than one percent of the total demand on these systems. Enrollment in Kodiak's school system could increase minimally. This increase could be accommodated by facilities necessary to meet the needs of base-case enrollment. Law-enforcement and health-care facilities would virtually be unaffected by the OCS-generated population. Enclave residents would commute between work areas and their residence through local airports. Support and supply vessels would use local docking and marine store facilities. Under these conditions, it is unlikely that the added resident and enclave population would have an effects on local sociocultural systems; but there could be some social friction at the airport from the transiting of offshore personnel by common carrier during peak fishing periods when space is at a premium. Such episodes, if encountered, are expected to be infrequent and of little long-term consequence for local sociocultural systems.

CONCLUSION: Sociocultural effects are expected to be very low.

CUMULATIVE IMPACTS: Future oil and gas lease sales in the Gulf of Alaska Region. potentially could contribute causal agents for change to the sociocultural systems of the Kodiak area. Perhaps even more so could be those offshore federal lease sales in the Bering Sea (as well as nearshore and onshore production) which could contribute to the creation and operation of a major oil terminal on the south side of the Alaska Peninsula. Tankering from this terminal could affect the sociocultural systems of the Kodiak area and its Island villiages through interaction within the range of Kodiak fishermen and village subsistence harvests. However estimated activities for the cumulative case are low as are the oil and gas resource estimates. For these reasons it is assumed cumulative impacts will remain low for the Kodiak planning area.

CONCLUSION: Cumulative OCS effects are expected to be very low.

(j) Impact on Military Uses

This is not a subject discussed in the Alaska Region as there are no ristricted areas.

b. Unavoidable Adverse Impacts

Section IV.B.11.b. presents a discussion of the unavoidable adverse impacts of the proposl for all Alaskan Planning Areas.

c. Relationship Between short-term uses of the environment and the Maintenance and Enhancement of Long-term Productivity

Section IV.B.11.c. presents a discussion of the relationship between short-term uses of the environment and the mainterance and enhancement of long-term productivity attendant to the proposal for all Alaskan Planning area.

d. Irreversible and Irretrievable Commentment of Resources

Section IV.B.11.d. presents a discussion of the irreversible and irretrievable commentment of resources attendant to the proposal for all Alaskan planning areas.

e. Impacts of a High Case Scenario

This section provides a discussion of the potential environmental impacts that could occur in the unlikely event that all unleased, undiscovered, economically recoverable hydrocarbon resources in the Kodiak planning area are leased and developed as a result of the proposal. The estimated "High Case" hydrocarbon resources for the Kodiak planning area are: 150 million barrels of oil and 2920 billion cubic feet of gas. These estimates are higher than the "Base Case" for the proposal. (95 million barrels of oil; 1840 billion cubic feet of gas). Infrastructure expected to be used to explore and develop these resources includes 24 exploration and delineation wells, 66 development wells and 2 platforms, which is not significantly different from the proposal (10 exploration and delineation wells 23 development wells and 1 platform). In addition, the estimated number of oil spills greater than 1,000 barrels remains at one, the same as the base case proposal. It is important to point out that Kodiak area does not have existing offshore development. Resource estimates and infrastructure for the high case are the same as the cumulative case. However, the high case assumes that the resources will be developed as a result of the proposed 5-Year program, while the cumulative assumes that leasing and development will extend over future 5-year program's lease sales.

Impacts to all resource catefories are expected to remain the same, with the possible exception to remain the same, with the possible exception of the sociocultural environment (employment and demographics). During the development phase, impact levels on employment and demographic could change from low to moderate. This is based upon an increase in platforms (from 1 to 2) and corresponding increase in transportation associated with the high case. However, the projected amount of oil spills remains the same (1), and therefore impact levels on other sociocultural areas are expected to remain the same (low) as for the proposal.

The high case hydrocarbon resources are nto sufficiently different to raise impacting factors on air and water quality. Therefore, impact levels will remain low as for the proposal.

Due to the fact that the estimated number of oil spills greater than 1,000 barrels remains at one (the same as the base case proposal), impact levels on all biological resources are expected to remain the same as for the proposal (from low to moderate depending upon the and populations).

f. Impacts of Alternative II - Subarea Deferrals

This alternative evaluates the possible deferral of 13 subarea. These are in addition to the 14 subarea defferal under Alterternative I. None of the additional subarea deferral included in Alternative II are within this planning area, therefore, the expected environmental impacts of Alternative II in this planning area are identical to the expected impacts of the proposal.

g. Impacts of Alternative III - Add a Sale in the Straits of Florida

Adding a sale in the straits of Florida will not effect this planning area. However, under Alternative III all sales proposed in Alternative I - the proposal, would be held. Therefore, the expected impacts of Alternative III are identical to Alternative I for this planning area.

h. Impacts of Alternative IV - Biennal Leasing

Because no difference in the number of sales, and therefore in the development assumptions is anticipated for this planning area between this alternative and the proposal there will be no change in impact levels for the resources analysed in the physical biological and socioeconomic environments.

i. Impacts of Alternative V - Acceleration Provision

Because no difference in the number of sales or development assumptions is anticipated for this planning area between this alternative and the proposal these will be no change in impact levels for the resources analysed in the physical biological and socioeconomic environments.

j. Impacts of Alternative VI - Defer Leasing in Six Planning Areas: North Atlantic, Washington and Oregon, Northern California, Central California, Southern California, and North Aleutian Basin

Selection of Alternative VI would defer leasing in the six planning areas only on of which (North Aleutian Basin) is in the Alaska Region. Therefore, impacts in this planning area (Kodiak) would be the same as describe for Alternative I (The Proposal).

k. Impacts of Alternative VII - No Action

Under this altenative, the Secretary of the Interior would propose not to schedule any oil and gas lease sales for this proposed 5 year program. All potential impacts from OCS oil and gas activities to the physical, biological, and socioeconomic environment resulting from hydrocarbon exploration, development, and production would be eliminated.

Oil and gas are currently the nation's primary energy source. Even with a vigorous conservation program the United States demand for energy will continue to grow. With the adoption of Alternative VII the oil and gas that would have been available as a result of this proposed program would no longer contribute to the national domestic production during the life of the program.

With the removal of the potential oil and gas into the national energy reserves, it would necessitate the increased production of energy from other conventional and non-conventional energy sources (See Appendix C), and/or increases in import levels from foreign sources. Impacts resulting from the development of the alternative energy sources are summarized in Section II.A.7. and discussed further in Appendix C.

13. Cook Inlet

a. Alternative 1

The proposal includes the holding of one sale in the Cook Inlet planning area. It is estimated that the sale will produce about 179 million barrels (MMbbls) of oil and 298 billion cubic feet of gas over a 35 year period. These resources will be produced from 32 production wells from 1 platform. In addition to the oil and gas, about 250 MMbbls of formation water will be produced. Approximately 185 thousand barrels of drilling muds and fluids and 531 thousand barrels of drill cuttings could be discharged into the sea over the life of the proposal. About 10 exploration wells will be drilled. It is anticipated that 2 support bases will be expanded and that at least 1 onshore facility will be expanded. For a generic discussion of impacts on resource catagories see Section IV.B.11.(3), (4) and (5). Area specific discussion follows.

(1) Interrelationships of Proposal with Other Projects and Proposals

Section IV.B.11.a.(1) presents a discussion of the interrelationship of the proposal with other projects and proposals for all Alaskan planning areas.

(2) Projects Considered in Cumulative Impact Assessment

Section IV.B.11.a.(2) presents a discussion of the projects considered in the cumulative impact assessment for all Alaskan planning areas.

(3) Physical Environment

(a) Impact on water quality

In the Cook Inlet, anchoring of exploration vessels or the one production platform and entrenchment of the two pipelines would increase turbidity only temporarily over a limited area. Platform discharges of drilling muds during exploration and production would contaminate less than 1 square kilometer per platform. Production but not exploratory discharge would continue intermittently over 35 years. The one oil spill of 1,000 barrels or greater that is estimated could significantly, but temporarily, increase water column hydrocarbon concentrations over several hundred kilometers causing a temporary degradation of water quality. Because of the low level of anticipated activity and pollution opportunity, impacts on water quality would be low.

CONCLUSION: Impacts on water quality from the proposal would be low.

CUMULATIVE IMPACTS: Cumulative effects on water quality may be observed from additional development projects in the Cook Inlet region. However, cumulative oil spill numbers remain at one over 1,000 barrels. Only 21 more exploratory wells and 2 more production wells are added in the cumulative case. Oil and gas leasing in the territorial waters of this region would yield waste-water discharges (estimated to approximate the proposal).

These effects are likely to be very low because of the small increase of activity. It should be noted, however, that it is difficult to judge the significance of these additional effects in the absence of site-specific information on the volume of effluent loading, the contaminants being discharged, and the mixing characteristics of the receiving waters. Cumulative water-quality effects from subsequent development proposals will be evaluated in future EIS's on major actions.

CONCLUSION: Cumulative effects on water quality in Cook Inlet are likely to be low.

(b) Impact on air quality

In the Cook Inlet, effects on air quality from the proposal are expected to be low, based on projected emissions of offshore exploration and production activities and potential onshore facilities in an area of pristine air quality. Projected peak emissions would not exceed State or Federal air quality limitations unless concentrated nearshore in small areas. In that event, existing control technology would ensure attainment of standards, although air quality would not be absolutely pristine near facilities. Air quality effects for the proposal are expected to be analogous to those identified for Lease Sales 46 (Kodiak; USDOI, BLM, 1980) and 60 (Lower Cook Inlet/Shelikof Strait; USDOI, BLM, 1981). Onshore emissions also would be subject to Federal PSD review and modeling.

Because of the size of the area, probable distance from shore of potential production facilities, and small number of offshore production facilities, air quality effects are likely to be low. All pollutants (except NOx) are expected to be below exemption levels, and State and Federal regulatory agencies can require application of control technology necessary to attain air quality standards for all pollutants.

CONCLUSION: Direct effects on air quality from activities of the proposal would be low.

CUMULATIVE IMPACTS: Cumulative effects of offshore emissions also are expected to be low because activity levels and discharges will be close to that of the proposal. The cumulative amount of offshore emissions which could occur nearshore may be estimated by combining the emissions projected from Gulf of Alaska, Kodiak, and Shumagin planning areas. The combined production related emissions would exceed Department of the Interior air quality analysis exemption levels for all pollutants if all operations were located at common boundries within 5 kilometers (3 miles). This is highly unlikely, especially because prior tract bids in the Cook Inlet indicate interest much farther offshore and widely dispersed. The estimated spill rate of 1 over 1,000 barrels is the same as the proposal as are the number of production platforms (1) and onshore facilities (1).

Cumulative air quality effects would occur at Anchor Point as a result of the piping of natural gas from an LNG facility. This facility would have to meet all Federal and State air quality standards and Class II PSD standards and, as such, control technology would be required.

Again, because an oil-storage and marine-loading terminal would be required to meet State and Federal ambient air quality and Class II PSD limitations, no unavoidable effects on air quality are foreseen.

Because of the size of the area, probable distance from shore of potential production facilities, and small number of offshore production facilities, air quality effects are likely to be low. All pollutants except NOx are expected to be below exemption levels, and State and Federal regulatory agencies can require application of control technology necessary to attain air quality standards for all pollutants.

CONCLUSION: Cumulative effects of the proposal on air quality would be low.

(4) Biological Environment

(a) Impact on plankton and benthos

The projected level of exploratory (10 wells in 4 years) and production (1 platform) activity and the limited radius of effects (1 km per platform) would result in very low effects on planktonic and benthic organisms. Diluted discharges of formation waters (250 MMbbls), drilling muds and cuttings, about 185 thousand and 531 thousand barrels respectively, from offshore locations in the lease area might cause lethal or sublethal effects on organisms using pelagic areas including scallops, adult shrimp, other invertebrates, and their planktonic food web organisms. These discharges, however, will affect only a small portion of these widespread populations, and could result in low effects on regional Cook Inlet populations.

The one offshore oil spill of 1,000 barrels or greater which did not contact important nearshore areas could result in limited mortality, primarily on adult (pelagic) shrimp and planktonic food web organisms. An oil spill is expected to result in only a low effect on regional populations. An oil spill which impacted nearshore areas being used by planktonic eggs or larvae of shrimp, clams, scallops, or other invertebrates could result in low effects on these species, depending on the portion of a population present, the life stage, areal extent of the spill, the concentration of hydrocarbons, and length of exposure. There is, however, a moderate (44%) probability of an oil spill resulting from this lease sale.

Only the one major spill over 1,000 barrels could contact exposed nearshore areas with lethal concentrations of hydrocarbons when vulnerable life stages were concentrated in those areas and could produce a low effect on a portion of a regional population. Nearshore areas are used by concentrations of spawning adults, planktonic larvae, and juveniles using shallow waters. Larvae are particularly sensitive to hydrocarbon exposure, as reviewed in Section IV.A.4.

An oil spill reaching nearshore waters could affect the clam resources of the Cook Inlet lease area and may result in moderate impacts. Many razor clam were killed following the Amoco Cadiz tanker spill off the coast of

France (USDOI,1981).

The low resource levels (oil and gas) result in only 1 spill over 1,000 barrels sometime in the 35 year life of the proposal, and this has but a 44% chance of happening. These factors greatly reduce the impact on plankton and benthos.

CONCLUSION: Impacts from this proposal on regional Cook Inlet populations of plankton and benthos are expected to be low.

CUMULATIVE IMPACTS: In the Cook Inlet Planning Area, cumulative effects due to development of potential resources will come mainly from activities associated with oil and gas development (Federal and State ongoing and proposed petroleum development, commercial fishing operations, and other non-petroleum industry activities.)

The oil-spill risk in Cook Inlet is essentially the same as the proposal as a result of including the effects of future projects with the effects of the proposal. The number of exploratory wells only increases by 1 and production wells by 2 in the cumulative case; increased effects on some species (e.g., razor clams) can be expected. Low cumulative effects are most likely, except razor clam populations could experience moderate effects as a result of the cumulative factors in comparison to the low effects expected from the proposal.

CONCLUSION: Low cumulative effects are expected from the proposal.

(b) Impact on fish resources

The assessment of impacts on fish resources has been divided into sections on salmonids and crab.

Salmonids: The five species of Pacific salmon and the steelhead trout may be affected by seismic activity, drilling discharges, and oil spills. Seismic activity has been found to be relatively harmless to fish. The projected level of seismic activity and the limited radius of effects would result in very low effects on salmonids.

Diluted discharges of formation waters and drilling muds, cuttings, and fluids from offshore locations in the lease area is expected to have a low effect on adult salmonids, as discussed in Section IV.B.11.a.(4). The discharge of drilling muds, cuttings, and fluids and of formation waters during offshore drilling and production should have very limited localized effects on organisms in the pelagic habitat. Although the concentration of suspended solids in the upper surface plume of discharges is expected to be increased in the immediate area of the discharge, dilution of these discharges in the large water bodies of Cook Inlet would be rapid. In addition, vast areas of alternate habitat are available for fish which may encounter a discharge surface plume.

An oil spill which contacted nearshore areas being used by prespawning adults, fry, and juveniles could result in a moderate effect. The effect of oil on salmonids is discussed in Section IV.A.4. and IV.B.11.a.(4).

Only a major oil spill (1 over 1,000 barrels estimated) which contacted and exposed nearshore areas to lethal concentrations of hydrocarbons when vulnerable life stages were concentrated in those areas is expected to produce a moderate effect on a portion of a regional Cook Inlet population. The aggregate lethal and sublethal effects of seismic activities, drilling and production discharges, and other oil spills are expected to affect only localized groups of salmonids in the immediate vicinity of such events. If an oil spill occurs and contacts nearshore areas while prespawning adults, fry and juveniles are present, moderate effects could result.

CONCLUSION: Impacts on regional populations of salmonids are expected to be low. Impacts on local populations could be moderate.

CUMULATIVE IMPACTS: Activities which may produce cumulative effects on salmonids include other Federal and State ongoing and proposed petroleum development, commercial fishing operations, and other nonpetroleum industry activities. In Cook Inlet, oil from existing production tankered from Kenai, together with this proposal and potential production of State and Federal leases increase the combined probabilities of one spill occurring. Salmonids in these areas may experience increased effects as a result of the increased cumulative risks.

CONCLUSION: Regional and local Cook Inlet salmonid populations could experience moderate effects.

Crab: The projected level of exploration (10 wells) and production (1 platform) activity and the limited radius of effects would result in very low effects on crab. Diluted discharges of formation waters and drilling muds and cuttings from offshore locations in the lease area might cause lethal or sublethal effects on crab. These discharges, however, will affect only a small portion of these widespread larval drift populations, and could result in low effects on regional crab populations. If the one oil spill of 1,000 barrels or greater contacted important nearshore areas, mortality to a portion of the larval crab population could occur, however these effects would have only a low effect on the total crab population. The effects of hydrocarbons on crabs are reviewed in Section IV.A.4.

Only an oil spill which contacted and exposed nearshore areas to lethal concentrations of hydrocarbons when vulnerable life stages were concentrated in those areas is expected to produce a moderate effect on a portion of a regional population. If an oil spill were to contact a nearshore area inhabited by breeding adults, moderate effects could result.

Given the extensive distributions and numbers of crabs (king, tanner, dungeness) in Cook Inlet, the localized effects resulting from this lease sale are not expected to result in a change in regional populations and should result in a low overall effect.

CONCLUSION: Impacts of this proposal on regional populations of crab are expected to be low. Impacts could be moderate on local populations.

CUMULATIVE IMPACTS: In the Cook Inlet Planning Area, cumulative effects due to development of potential resources could come mainly from activities associated with oil and gas development (Federal and State ongoing and proposed petroleum development, commercial fishing operations, and other nonpetroleum industry activities). The oil spill risk in Cook Inlet is not expected to increase significantly in the cumulative case (the projected number of spills of greater than 1000 bbls in the cumulative case remains at 1, the same as the proposal). However, the effects of projected increases in tankering from Kenai with the effects of the proposal could produce a moderate effect on a portion of a regional population of Cook Inlet crabs.

CONCLUSION: Regional and local Cook Inlet crab populations could experience moderate effects.

(c) Impact on marine mammals

Nine species of nonendangered marine mammals-Pacific harbor seal, Steller sea lion, sea otter, northern fur seal, killer whale, harbor porpoise, Dall's porpoise, minke whale, and beluga whale--commonly occur in a portion of or throughout the Cook Inlet Planning Area and are very likely to have some interaction with OCS activities. Oil pollution from the 1 spill over 1,000 barrels (estimated) and disturbance due to increased human activity (10 exploratory wells and 1 production platform) could adversely affect marine mammal populations found in the planning area. The general effects of oil spills, noise and disturbance, and habitat alterations on marine mammals are discussed in Section IV.B.11.a.(4), Impacts on Marine Mammals in the Gulf of Alaska Planning Area.

Several thousand sea otters occurring in concentrations in Kamishak Bay-Cape Douglas area, Kachemak Bay-Kenai Peninsula coast, Barren Islands, Afognak Island and Wide Bay in Shelikof Strait are the marine mammal populations at greatest risk from oil spills that may be associated with the proposal.

If an oil spill (1 over 1,000 barrels estimated) contacted one of the above sea otter concentration areas, several hundred to a few thousand sea otters may be killed presenting a moderate effect on the population if recovery took one generation.

Large numbers of sea lions and harbor seals could become contaminated if a spill contacted the Barren Islands, Augustine Island, Puale Bay, or other important rookeries or haulout areas in the planning area. Harbor seals and sea lions probably would not suffer high mortalities from oil spill contact with only weak individuals and perhaps young pups suffering serious effects. Oil spills are likely to cause low effects on harbor seal and sea lion populations. The northern fur seal is also likely to suffer no more than low oil spill effects from even a large spill in the Cook Inlet planning area because fur seals are widely distributed along their migration route during spring and fall migrations with animals swimming through the area in small groups and not in large herds. The migration through the planning area also occurs over several weeks; thus, large numbers of fur seals are not likely to come in contact with even a large oil spill which would become highly weathered and dispersed within ten days of the spill release.

Harbor seals inhabiting major breeding and haulout habitats on Augustine Island, Kamishak Bay; Afognak Island, Puale Bay and other areas could be exposed to some noise and disturbance from the helicopter and support-vessel trips centered out of onshore support or development facilities at Kodiak airport, Homer or Kenai. Sea lions breeding on the Barren Island may be disturbed by some aircraft overflights. However, noise and disturbance from aircraft and vessel traffic would be very transitory and brief in duration. The frequency of disturbance is likely to be low and of little apparent consequence, unless pupping activities are disrupted. Disturbance of harbor seal and sea lion rookeries during the pupping season could significantly reduce pup survival. However, the Marine Mammal Protection Act and existing regulations could help to prevent excessive disturbance of harbor seals and other marine mammals. Thus, overall levels of disturbance effects are likely to be low.

Although cetaceans could be exposed to an oil spill or gas condensates on the water surface or in the water column, only highly stressed individuals could possibly suffer serious sublethal effects [see discussion of generic effects under Sec. IV.B.11.a.(4)] from the probable, very brief exposure to concentrated hydrocarbons; thus oil spill (1 spill in 35 years) effects on cetaceans in the Cook Inlet Planning Area are likely to be very low.

Noise and disturbance from air and boat traffic and seismic-geophysical exploration activities associated with offshore oil and gas activities in the Cook Inlet area could cause brief startle, annoyance, and/or flight responses of whales, dolphins, and porpoises. However, present knowledge of cetacean behavior in association with industrial noise sources suggests that effects of disturbance on nonendangered cetaceans are likely to be very low. Construction activities associated with the proposal, such as installation of the one oil and gas platform and 2 offshore pipelines, are likely to have short-term or very low effects on cetaceans with any avoidance of drill platform sites or pipeline routes by whales or other marine mammals subsiding after construction activities are complete.

CONCLUSION: The proposal could have moderate effects on sea otters, low effects on pinnipeds, and very low impacts on nonendangered cetaceans.

CUMULATIVE IMPACTS: The additive effects of other ongoing and planned projects, as well as the proposal on nonendangered marine mammals occurring in the Cook Inlet Planning Area and the Gulf of Alaska are discussed in Section IV.B.11.a.(4) Impact on Marine Mammals in the Gulf of Alaska Planning Area. A summary of these effects are as follows. Oil spills (only 1 estimated) that may be associated with cumulative oil and gas activities and other marine traffic could have moderate effects on sea otters and possibly fur seals, and low effects on otter and pinniped populations and very low effects on cetacean populations. Noise and disturbance from cumulative air and vessel traffic and increased human presence associated with oil activities (10 exploration wells and 1 production platform) and other development projects could have moderate cumulative effects on harbor seals or sea lions if important rookeries were frequently disturbed while cumulative disturbance effects on other marine mammal populations are likely to be low. Cumulative changes in prey-food source abundance and distribution due primarily to commercial fishing, particularly if bottom fisheries for demersal fin fish increase, could have moderate cumulative impacts on some marine mammal populations. The overall cumulative impact from the above projects on marine mammals would be moderate, however, the proposal with existing development activities is likely to have no more than moderate effects on sea otters and other pinnipeds and low effects on nonendangered cetaceans.

CONCLUSION: The proposal and existing development activities could have moderate effects on sea otters and pinnipeds and low impacts on nonendangered cetaceans.

(d) Impact on coastal and marine birds

In the Cook Inlet area, three of the five major colonial nesting species (common murres, tufted puffins, and fork-tailed storm petrels) and the greater majority of the marine wintering species are among the most vulnerable to oil pollution. Sensitive marine bird populations that occur in this area would be at relatively high risk from oil and gas development. Large nesting colonies of vulnerable species on the Barren Islands may be affected by oil spills that reach the islands or occur within important offshore concentration areas. Tens of thousands of shearwaters that concentrate in the northern foraging area could also be adversely affected directly and indirectly by an oil spill. Highly vulnerable sea ducks and alcids that winter in the Shelikof Strait could experience detrimental effects from an oil spill in the Shelikof Strait area, especially during the winter and fall. However, the low probability of an oil spill (1 estimated in 35 years) tends to negate somewhat the overall risk to bird populations.

If an oil spill occurs (1 over 1,000 barrels estimated) in the Cupreanof Strait or Whale Passage areas, high effects to marine birds are very likely to occur, since this area is a very important year-round concentration area in the Kodiak-lower Cook Inlet region. More specifically, The Kupreanof Strait-Raspberry Island western coast and Kinak Bay-Kukak Bay area and the western side of the Shelikof Strait are coastal habitats at greatest risk from an oil spill.

Chronic small oil spills are the most likely spills and inevitable in occurrence to a certain degree. Such spills are most likely to be a problem near shore facilities (1 estimated) and along tanker routes. Even small quantities of chronic oil discharges in addition to accidental discharges, if they occur in an important marine bird concentration area, could have a detrimental effect on marine birds that utilize the area.

Numerous sea bird colonies along the coast of the planning area could be affected by increased air and boat traffic during OCS development activities. Large colonies on the Barren Islands, Gull Island near Chinita Bay, Flat Island south of Kachemak Bay, Chisik Island colonies, and other bird colonies in the area could be subject to additional air traffic from OCS support activities which may lead to reduced productivity and population reductions from disturbance. The responsive increase in gull populations to human development and to associated increases in waste and garbage disposal sites could have a significant adverse effect on other marine bird species. Depending on the location, size, and season, a spill could impact thousands and perhaps several hundred thousand marine and coastal birds. Such a spill could result in effects on bird populations within the lower Cook Inlet-Shelikof Strait, Kodiak, and Barren Island areas.

CONCLUSION: Regional impacts on coastal and marine birds could be moderate. Local impacts could be high.

CUMULATIVE IMPACTS: While many seabirds do not undertake extensive migration, some do migrate through or overwinter in or near other areas and, therefore, are subject to an increased oil spill risk. Most waterfowl and shorebirds are highly migratory and thus likely to migrate through, overwinter in or breed near other State or Federal lease areas. Spills and/or disturbance which adversely affect breeding stocks of certain seabird species at more than one major colony also could result in a significant reduction of their regional populations.

Other factors which may make a substantial contribution to cumulative effects include mortality resulting from birds accidentally captured in salmon driftnets and the long-term effects of habitat degradation, disturbance, and possible alteration or reduction of prey species populations. A combination of such factors could result in a decline in regional seabird populations.

CONCLUSION: Regional marine and coastal bird populations could experience moderate impacts as a result of cumulative factors. Local impacts could be high.

(e) Impact on Endangered and Threatened Species

Endangered species' use of this planning area is very limited as most species' density and diversity is higher in more open areas along their migration routes or at the terminus of the migration. No endangered birds or plants are known to occur in or adjacent to the planning area. Occasionally gray, fin and humpback whales have been observed in this area, primarily in Shilikof Strait, Stevenson or Kennedy Entrances. Only the minke and beluga whales (nonendangered) are frequently observed in Cook Inlet. Refer to Section IV.B.11.a.(4) in this document, Sale 88 FEIS and Sale 60 FEIS for more information on effects to endangered species resulting from oil and gas activities in the Cook Inlet/Shilikof Strait planning area.

A formal Section 7 Endangered Species Consultation of MMS with NMFS and the FWS was conducted for the proposed sale Gulf of Alaska/Cook Inlet planning area. The biological opinion from the FWS was dated November 10, 1983 and covered peregrine falcons. The biological opinion from NMFS is dated

January 13, 1984 and covered North Pacific right whales and gray whales. See Chapter V for a further description of the consultation process for Section 7 of the Endangered Species Act of 1973.

There is a three percent marginal probability of discovering the 179 mbbls of oil speculated to be in the planning area. It is expected that up to 10 exploratory and delination wells and up to 23 development/production wells will be drilled from one platform over the life of the field. During the thirty-five years one oil spill could occur that would be larger than 1,000 bbls. If a spill occurred in the planning area, the probability of contacting endangered whales or birds would be insignificant (probably contact less than one percent of the species population). Any noise associated with the production or development of the oil resources is not likely to occur in an area of very limited whale usage. Therefore, due to the infrequent usage of the planning area by endangered species, any effect resulting from oil and gas activities are unlikely to affect these species. Those individuals that could be affected are most likely transients from the preferred whale-use areas located outside the planning area.

CONCLUSION: Any endangered species that may be affected by activities associated with the proposal are likely to have very low impacts.

CUMULATIVE IMPACTS: Activities associated with this planning area are not expected to contribute to cumulative effects significantly. This is due to the low usage of the area by endangered species and the low probability of discovering and producing the resources in this area.

CONCLUSION: Impacts are expected to be very low.

(f) Impact on estuaries and wetlands

These topics are discussed and impacts analyzed where they occur as habitat for the fish and wildlife species in (4)(a) through (4)(f) in this section.

(g) Impact on areas of special concern

These areas are all habitat for the fish and wildlife species in (4)(a) through (4)(f) and impacts are discussed as they occur in the planning areas.

(h) Impact on marine sanctuaries

There are no marine sanctuaries in the Alaska OCS Region.

(5) Socioeconomic Environment

(a) Impact on employment and demographic conditions

For detailed discussion on employment and demographic conditions see the Lower Cook Inlet-Shelikof Strait (Sale 60) FEIS (USDOI, MMS, 1981) and Gulf of Alaska-Cook Inlet (Sale 88) FEIS (USDOI, MMS, 1984).

The development scenario for the proposal indicates that there will be 1 onshore facility, one marine support base and one air support base. The new-resident population generated by onshore activities would be the primary effect-causing agent in terms of community infrastructure. Population increases (about 300 people) result in an increased demand and the use of existing infrastructure, and severe adverse effects can result when use exceeds the facility/service capacity. Rapid fluctuations in population levels can result in crowding of facilities, shortages in supply, or reduction in service standards.

Generally, the effects on infrastructure attributed to OCS-initiated population growth would be low or very low. Between 1987 (start of the program) and 1993 (start of exploration work), which are the years of highest base-case activities, offshore activities would have virtually no effects on the Kenai Peninsula's infrastructure. Education, health care, law enforcement, and fire protection systems should not be affected, while electrical, water supply, and sewage treatment needs would not account for much of the total demand. During the periods of peak OCS population growth associated with offshore activities (2000-2001), the demand on services and facilities would increase slightly. However, the effect would be minimal. Educational, health care, and law enforcement personnel levels would have to be expanded slightly, but the increases would be minimal when compared to the base case.

The resident population on the Kenai Peninsula is estimated to increase by 300 persons under the proposal during the period 1993-2006. Enclave and commuter population associated with the proposed lease sale is inconsequential. As a consequence, there should be no effects to the socio-cultural systems on the Kenai Peninsula from enclave or commuter population associated with the proposal. Increased resident population from activities related to the lease sale could tend to increase the existing contradictions among renewable/nonrenewable and conservation/development elements of society.

Employment on the Kenai Peninsula would increase as a result of the proposal as residents become employed directly or indirectly with the exploration and development of oil. The first increase in employment would occur in 1993, and peak employment would occur at about 2001. The maximum difference between the present and the proposal would occur in 2001 and 2002, when about 525 more individuals would be employed.

CONCLUSION: The population increases resulting from offshore activities would have a low effect on the Kenai Peninsula's community infrastructure.

The proposal is expected to have low economic impact on the Kenai Peninsula.

CUMULATIVE IMPACTS: Cumulative effects of Federal oil and gas development in the Cook Inlet Planning Area plus State government activities could increase area employment and population to a small degree. Because the Anchorage/Matanuska Valley/Kenai Peninsula are estimated to be the areas of most population growth because of activities generated by oil and gas leasing, most of the cumulative population growth would be in those areas especially because of their closeness to the planning area. Therefore, low cumulative impacts on the Kenai Peninsula's community infrastructure can be expected.

CONCLUSION: Cumulative impacts are estimated to be low.

(b) Impact on coastal land uses

The location of an oil and/or gas processing and storage facility along the shores of Cook Inlet, specificaly the Kenai Peninsula, would not be an atypical land use, given the oil and gas processing complex located at Nikiski, north of the city of Kenai. Areas, such as Anchor Point, which could serve as a pipeline landfall and or potential terminal site are held largely by private owners. The construction of a gas or oil pipeline from Anchor Point to the Kenai-Nikiski area would increase land values. However, overall impacts to land use would be mitigated to the extent that an existing utility corridor which parallels the Sterling Highway (a coastal route) could be used for the siting of an oil or gas pipeline.

CONCLUSION: Impacts to coastal land use are expected to be low.

CUMULATIVE IMPACTS: The Cook Inlet region is the most economicaly dynamic area in the State of Alaska. The effects of the proposed action measured against the changes in land use caused by other projects projected for the planning area is expected to be very low, due to existing onshore facilities already dedicated to onshore oil and gas activities, and certainly much less than the activity currently resulting from Cook Inlet production.

CONCLUSION: Cumulative impacts should be low.

(c) Impact on the commercial fisheries

The commercial fisheries of the Cook Inlet planning area are of three political-economic designations: (1) domestic, (2) foreign, and (3) joint-venture. Together these operations harvested (1980) 8.2 percent of the total fish catch from all U.S. water. The Gulf of Alaska includes the Kodiak, Shumagin, and Cook Inlet Planning Areas and accounted for 40 percent of the total Alaska catch by U.S. fishermen and about 15 percent of the foreign fleets' Alaskan waters catch. Domestic Gulf of Alaska fisheries are mostly coastal. There are distinct fisheries for dungeness crab, king crab, tanner crab, shrimp, scallops, salmon, herring, and halibut. Each fishery has its own set of regulations. Salmon dominate harvests in the Gulf of Alaska with pinks forming the bulk of the catch. Herring, halibut, sablefish, crab, and shrimp are also fished. Typically, more than 80 percent of the salmon are taken by seiners. Shellfish follow in order of magnitude and value, then herring and halibut.

Foreign fisheries in the area are confined by the Fishery Conservation and Management Act of 1976 (FMCA) to groundfish--mainly pollock, turbot, cod, rockfish, and sablefish. Japan and South Korea are the principal nations fishing in the area at this time, and their fisheries are primarily trawl and longline. Annual groundfish harvests by foreign fleets from the Gulf of Alaska have averaged about 200,000 metric tons in recent years.

Analysis of the exploration, development, and production scenarios for the planning area indicate that there will be minimal oil and gas generated activities. There would be only 10 exploration wells, one production platform and 1 onshore facility. Shellfish and groundfish are harvested in the Cook Inlet/Shelikof Strait area along with herring and salmon. Although Cook Inlet oil development could conflict with commercial fishing, the relatively limited fishing area (about 106 sq km) removed by the one production platform and the 2 pipelines--compared to the total area--would seem to have low effect on commercial fishing.

To date, onshore construction projects related to offshore oil and gas exploration and development in this area have had low effect on the fishing industry. The workforce for oil and gas development has largely come from outside the fishing industry, and this is expected to continue so long as income derived from fishing remains at current levels.

Loss of fishing area through the presence of offshore platforms and pipelines is assessed as low. If it is assumed that one exploratory platform (10 wells over a 4 year period) would be operating in the Cook Inlet/ Shelikof Strait area, and that an exploratory platform preempted a 1,000-meter radius around the platform from any fishing activity; then approximately 6.3 square kilometers would be preempted at any one time in the entire planning area during exploration. If the same assumptions are used for the one development platform, then approximately 6.3 square kilometers would be preempted. If trawlers avoided pipelines using a 500-meter buffer on either side of the pipelines, then about 100 square kilometers would be lost to fishing. Therefore, the total area that could be lost to trawling for pelagic and demersal fish (groundfish) would be 6.3 square kilometers during exploration and 56.3 square kilometers during development and production. Since this represents a relatively small area relative to the large area used by both foreign and domestic trawlers in this region, only a low effect to commercial fishermen is expected, even if harvest losses were conservatively estimated as being proportionate to the total area preempted.

Secondary effects on fishing would be to the gear (mainly crab pots). This effect would be very low, given the limited fished area and seasonality of these fisheries and the recent oil/fish industry coordination effort.

CONCLUSION: Impacts on the regional fishing industry from the proposed action are estimated to be low.

CUMULATIVE IMPACTS: State and Federal oil and gas lease sales in Cook Inlet would maintain the present rate of tanker traffic through the area for a longer (up to 35 plus years) time. Cumulative estimates, however, are for 1 production platform and resource recovery is not sufficient to increase the number of spills over that of the proposal.

Vessel traffic other than oil- and gas-related transport is projected to increase in the lease area as the population of Alaska increases--another cumulative cause. The increase in U.S. groundfishing could increase traffic effects in the future. The effect of these continuing or increasing transportation efforts could be increased conflicts between fishing vessels and other ships and could affect docking, harbor, and supply needs.

CONCLUSION: The cumulative impact on the regional commercial fishing industry is expected to remain low, as for the proposal.

(d) Impact on recreation and tourism

Most effects on recreation and tourism would be changes in economic values and noneconomic qualities. Changes in the number of users, property values, and visual qualities are examples. Effects are similar to those given in the Sale 88 FEIS (USDOI, MMS, 1984). The increase in numbers of users due to the proposal would place some stress on the visual qualities and property values in a local area for a period of time. Changes in visual quality would be local and would extend only for short periods of high activity (such as drilling or pipe laying) over the duration of the lease. However there are already 14 oil and gas producing platforms in the Cook Inlet area. The proposal plans to add one more.

The Cook Inlet lease area is expected to produce 179 million bbls of oil and 298 billion cubic feet of gas. Based on these figures, one spill greater than 1,000 barrels is assumed in 35 years.

Because the recreation and tourism facilities of the Kenai Peninsula are already crowded, the additional population (about 300 people) will add somewhat to the congestion. Steps are being taken at the State and local levels to increase recreational opportunities but the problem will continue to exist and the proposal does add slightly to the problem. However, over the life of the proposal (35 years) the addition is minimal, especially compared to the projected influx of tourists desiring recreational opportunities on the Kenai Peninsula.

CONCLUSION: Impacts on recreation and tourism are low.

CUMULATIVE IMPACTS: The cumulative impacts are expected to be somewhat higher than the proposal because the one production platform and the extension of time over which hydrocarbons are produced will add people to the Kenai Peninsula. This will further stress recreation and tourism facilities.

CONCLUSION: The cumulative impacts are expected to be moderate.

(e) Impact on archaeological resources

Effects on archaeological resources would result from disturbance to underwater landforms, shipwrecks, and historic sites. Onshore prehistoric and historic sites may be affected by increases in industrial operations which in visiting the site accidently disturb it. Effects are similar to those given in the Sale 88 FEIS (USDOI, MMS, 1984). Four onshore historic sites are especially important and would be affected moderately. Given the small number of offshore blocks on which habitable landforms have survived, there is small chance of effect offshore. A number of shipwrecks exist in the area. The effect on these would be low.

The Cook Inlet Planning Area is expected to produce 179 million bbls of oil and 298 billion cubic feet of gas. Based on these figures one spill greater than 1,000 barrels is expected in 35 years. Due to the anticipated low level of disturbance factors coupled with the low probability of interaction between oil and gas development activities and archaeological resources, the effects are expected to be low.

CONCLUSION: Impacts on archaeological resources are low.

CUMULATIVE IMPACTS: Cumulative effects on archaeological resources would be caused by future Federal and State oil leasing, the construction projects, other private State and Federal projects, and the continual influx of people wanting to live in the area and the continuing production of hydrocarbons from Cook Inlet. Together with the proposal, they result in an unlikely chance of interaction with archaeological resources.

CONCLUSION: The regional cumulative impacts are expected to be low.

(f) Impact on transportation systems

The effects of the proposal would be on the transportation modes on the Alaska Peninsula and in Anchorage.

Considering the Port of Anchorage there is no doubt that it would be able to handle any or all of the logistics activities related to the proposal. Total freight operations for the Cook Inlet proposal would average less than 5 percent of the port's annual throughput. In regard to the Kenai Peninsula facilities, the rig tenders' dock has supported petroleum production on State leases for some two decades. Surplus capacity now exists within the subject facilities' infrastructure to easily handle the level of activity estimated for the proposal. The tanker loading terminal would generate a low level of traffic, perhaps one vessel every 10-20 days. The airfield at Kenai which might handle most of the air traffic associated with the proposal may require some upgrading of facilities in additional apron space, navigational aids, hangers, warehouse and terminal facilities. The highway system effected by the proposal is in the process of being upgraded and in parts has already been upgraded. The overall effects of the proposal are, therefore, expected to be low.

CONCLUSION: The transportation systems effects of the proposal are expected to be low.

CUMULATIVE IMPACTS: Given the vigorous nature of the economy of the Cook Inlet communities and projects forecast for this area, the overall effects of the proposal are expected to be low.

CONCLUSION: Cumulative impacts are expected to be low.

(g) Impact on military uses

This is not a subject discussed in the Alaska OCS Region as there are no restricted areas.

(h) Impact on subsistence-use patterns

For a more detailed discussion of impacts on subsistence use patterns, see the Lower Cook Inlet-Shelikof Strait (Sale 60) FEIS (USDOI, MMS, 1981) and Gulf of Alaska/Cook Inlet (Sale 88) FEIS (USDOI, MMS, 1984). A discussion of subsistence impacts is also in Section IV.B.11.a.(5).

One major spill of 1,000 barrels or greater would be expected. Subsistence marine resources used by residents of the Kenai Peninsula Borough could be affected by an oil spill in lower Cook Inlet and residents of the northwestern Kodiak Island Borough could be impacted if the spill occurred in Shelikof Strait. However, the low probability of an oil spill contact (one estimated in 35 years) tends to negate the overall risk to subsistence use of marine resources. Also subsistence-use is low in the Kenai Peninsula and total population is low in the Shelikof Strait area.

Because of the Kenai Peninsula communities' extensive experience with the petroleum industry related activities and because of the small expected increase in new permanent residents, the overall effects on subsistence-use patterns are expected to be low.

CONCLUSION: Based on the type of subsistence harvest and the population's subsistence-use characteristics, the overall effects on subsistence in the planning area would be low.

CUMULATIVE IMPACTS: Increased air and marine traffic in Cook Island and tankering of crude from previously leased Federal acreage could, but does not, increase the threat of oil spills on the subsistence resources used by the residents of the planning area. The marginal increase in traffic is expected to have low impact on subsistence resources. Salmon and other marine subsistence resources are relatively plentiful and potentially not subject to harvest conflict. Only a marginal increase in oil spill risk to subsistence resources would be expected from the proposal (projected oil spills remain the same (1) for the "Base Case" as for the proposal; resource estimates increase from 179 MMbbls to 210 MMbbls).

CONCLUSION: The cumulative impact of oil spills and other industry activities are expected to result in low impacts on subsistence in the planning area.

(i) Impact on sociocultural systems

Except for the Shelikof Strait area, the planning area generally encompasses parts of Alaska that already have gained experience with oil and gas development, either onshore or offshore. Federal lease sales and offshore exploratory drilling have occurred in the Cook Inlet/Shelikof Strait area, and there has been a contemporary history of offshore oil and gas production (on State leases) in Cook Inlet covering the last several decades. All of the communities in the Cook Inlet area experienced change as a result. The net effect has constituted as much a change in local sociocultural systems as a major learning experience for the regional community.

The proposal should add to this learning experience, but not contribute materially to change in regional sociocultural systems. Change is more likely at the community level.

The regional effects of the proposed lease sale to sociocultural systems should be marginal to change already brought about by oil and gas development in the Cook Inlet/Shelikof Strait area.

CONCLUSION: Sociocultural effects would be low.

CUMULATIVE IMPACTS: With the exception of the Cook Inlet/Shelikof Strait subregion, cumulative effects to regional sociocultural systems, if any, should be localized essentially at the community level.

In the Cook Inlet/Shelikof Strait region, localized sociocultural systems based on a fisheries orientation could be affected by additional Federal lease sales in the bulk of the Alaska Region and lease sales in the southern Bering Sea that would contribute to the rationale for having a major oil terminal sited on the south side of the Alaska Peninsula. This would introduce a new element of industrial activity to the western sector of the subregion which would offer the potential of introducing major change to selected local sociocultural systems. However, it is unlikely that this would be the case with the subregion as a whole and Cook Inlet in particular.

CONCLUSION: Cumulative impacts would be low.

b. Unavoidable Adverse Impacts

Section IV.B.11.b. presents a discussion of the unavoidable adverse impacts of the proposal for all Alaskan planning areas.

c. Relationship Between Short-term Uses of the Environment and the Maintenance and Enhancement of Long-term Productivity

Section IV.B.11.c. presents a discussion of the relationship between short-term uses of the environment and the maintenance and enhancement of long-term productivity attendant to the proposal for all Alaskan planning areas.

d. Irreversible and Irretrievable Commitment of Resources

Section IV.B.11.d. presents a discussion of the irreversible and irretrievable commitment of resources attendant to the proposal for all Alaskan planning areas.

e. Impacts of a High Case Scenario

This section provides a brief discussion of the potential environmental impacts that could occur in the unlikely event that all unleased, undiscovered, economically recoverable hydrocarbon resources in the Cook Inlet Planning Area are leased and developed as a result of the proposal. The estimated "High Case" hydrocarbon resources for the Cook Inlet Planning Area are: 180 million barrels of oil and 320 billion cubic feet of gas. These estimates are slightly higher than the "Base Case" (179 MMbbls and 320 BcF) for the proposal. Infrastructure expected to be used to explore and develop these resources includes 12 exploration and delineation wells, 42 development wells and one platform. This is not significantly different from the proposal (10 exploration and delineation wells, 32 development wells and one platform). In addition, the estimated number of oil spills greater than 1,000 barrels remains at one, the same as the base case proposal.

It is important to point out that Cook Inlet has existing offshore development. Resource estimates differ (180 MMbbls oil for High Case, 210 MMbbls for Cumulative Case) but infrastructure for the high case are the same as the cumulative case. However, the high case assumes that the resource will be developed as a result of the proposed 5-year program lease sales, while the cumulative assumes that leasing and development will extend over the future 5-year program lease sales.

Impacts to all resource categories considered may increase very slightly, however, the differences in impacts cannot be differentiated because of the insignificant differences between the high case and the proposal. Therefore, impacts in all resource categories are projected to be the same as the proposal.

f. Impacts of Alternative II - Subarea Deferrals

This alternative evaluates the possible deferral of 13 subareas. These are in addition to the 14 subareas deferred under Alternative I. None of the additional subarea deferrals included in Alternative II are within this planning area, therefore, the expected environmental impacts of Alternative II in this planning area are identical to the expected impacts of the proposal.

g. Impacts of Alternative III - Add a sale in the Straits of Florida

Adding a sale in the Straits of Florida will not effect this planning area. However, under Alternative III all sales proposed in Alternative I - the proposal, would be held. Therefore, the expected impacts of Alternative III are identical to Alternative I for this planning area.

h. Alternative IV - Biennial Leasing

Because no difference in the number of sales (and, therefore, no difference in development assumptions) is anticipated for this planning area between this alternative and the proposal, there will be no change in impact levels for the resources analyzed in the physical, biological and socioeconomic environments.

i. Alternative V - Acceleration Provision

Selection of this alternative would not cause a change in the number of sales or assumptions from those in Alternative I for this planning area. There will be no change in impact levels for the resources analyzed in the physical, biological and socioeconomic environments.

j. Impacts of Alternative VI - Defer Leasing in Six Planning Areas: North Atlantic, Washington and Oregon, Northern California, Central California, Southern California, and North Aleutian Basin

Selection of Alternative VI would defer leasing in one planning area (North Aleutian) in the Alaska Region. The impacts resulting from this alternative would be the same as described for Alternative VII (No Action) for this planning area.

k. Impacts of Alternative VII - No Action

Under this alternative, the Secretary of the Interior would propose not to schedule any oil and gas lease sales for this proposed 5-year program. All potential impacts from OCS oil and gas activities to the physical, biological, and socioeconomic environment resulting from hydrocarbon exploration, development, and production would be eliminated.

Oil and gas are currently the nation's primary energy source. Even with a vigorous conservation program, the United States' demand for energy will continue to grow. With the adoption of Alternative VII, the oil and gas that would have been available as a result of this proposed program would no longer contribute to the national domestic production during the life of the program.

With the removal of the potential oil and gas into the national energy reserves, it would necessitate the increased production of energy from other conventional and non-conventional energy sources (see Appendix C), and/or increases in import levels from foreign sources. Impacts resulting from the development of the alternative energy sources are summarized in Section II.A.7 and discussed further in Appendix C.

14. Shumagin

a. Alternative 1

The proposal includes the holding of two sales in the Shumagin Planning Area. It is estimated that the sales will produce about 48 million barrels (MMbbls) of oil and 1,363 billion cubic feet of gas over a 35 year period. These resources will be produced from 30 production wells from one platform. In addition to the oil and gas, about 250 MMbbls of formation water will be produced. Approximately 190 thousand barrels of drilling muds and fluids and 417 thousand barrels of drill cuttings could be discharged into the sea over the life of the proposal. About 9 exploration wells will be drilled. It is anticipated that one support base will be expanded and that at least three onshore facilities will be developed.

(1) Interrelationships of Proposal with other Projects and Proposals

Section IV.B.11.a.(1) presents a discussion of the interrelationship of the proposal with other projects and proposals for all Alaskan planning areas.

(2) Projects Considered in Cumulative Impact Assessment

Section IV.B.11.a.(2) presents a discussion of the projects considered in the cumulative impact assessment for this planning area.

(3) Physical Environment

(a) Impact on water quality

Refer to Section IV.B.11.a.(3) in this document for details on impacts to water and air quality that may occur in the Alaska Region as a result of oil and gas activities associated with this proposal. These are summarized in the following discussions. In the Shumagin Planning Area, anchoring of exploration or production platforms and entrenchment of pipelines would increase turbidity only temporarily over a limited area. The discharge of an estimated 250 million bbls of formation waters, 189 thousand bbls of drilling muds, and 417 thousand bbls of drill cuttings could result from the anticipated exploration and production activities. These site specific discharges could result in high impacts within a few meters to tens of meters from the discharge; however, these will decrease to low with distance (1 km) from the source. Production discharges would continue intermittently over several years. The one assumed oil spill of 1,000 barrels or greater could significantly, but temporarily, increase water column hydrocarbon concentrations over several hundred kilometers.

CONCLUSION: Impacts on water quality from the proposal would be low.

CUMULATIVE IMPACTS: Cumulative impacts on water quality may be observed from the second Shumagin Sale and additional development projects in the region. Oil and gas leasing in the territorial waters of this region would yield waste water discharges. These impacts are likely to be low. It should be noted, however, that it is difficult to judge the significance of these additional effects in the absence of site-specific information on the volume of effluent loading, the contaminants being discharged, and the mixing characteristics of the receiving waters. Cumulative water quality impacts from subsequent development proposals will be evaluated in future EIS's on major actions.

CONCLUSION: Cumulative impacts on water quality in the Shumagin Planning Area are likely to be low.

(b) Impact on air quality

In the Shumagin Planning Area, impacts on air quality from the proposal are expected to be low, based on projected emissions of offshore exploration and production activities and potential onshore facilities in an area of pristine air quality. Projected peak emissions would not exceed State or Federal air quality limitations unless concentrated nearshore in small areas. In that event, existing control technology would ensure attainment of standards, although air quality would not be absolutely pristine near facilities. Air quality impacts for the proposal are expected to be analogous to those identified for Lease Sales 46 (Kodiak; USDOI, BLM, 1980) and 60 (Lower Cook Inlet/Shelikof Strait; USDOI, BLM, 1981). Onshore emissions also would be subject to Federal PSD review and modeling.

CONCLUSION: Direct impacts on air quality from activities of the proposal would be low.

CUMULATIVE IMPACTS: Cumulative impacts of offshore emissions also are expected to be low. The cumulative amount of offshore emissions which could occur nearshore may be estimated by combining the emissions projected from Cook Inlet, Kodiak, and Gulf of Alaska planning areas. The combined production related emissions could exceed Department of the Interior air quality analysis exemption levels for all pollutants if all operations were located at common boundaries within 5 kilometers (3 miles).

Cumulative air quality impacts may be seen at Balboa Bay as a result of the piping of natural gas from an LNG facility. This facility would have to meet all Federal and State air quality standards and Class II PSD standards and, as such, control technology would be required.

Again, because an oil-storage and marine-loading terminal would be required to meet State and Federal ambient air quality and Class II PSD limitations, no unavoidable impacts on air quality are foreseen.

CONCLUSION: Cumulative impacts of the proposal on air quality would be low.

(4) Biological Environment

(a) Impacts on plankton and benthos

Some marine organisms inhabit planktonic and benthic habitats in or adjacent to the Shumagin Planning Area south of the Alaska Peninsula. Crab species are most vulnerable in nearshore waters adjacent to the planning area. Generally, adults spawn in nearshore waters, move farther offshore, and 7 to 11 months later return to more shallow waters for their eggs to hatch. Their planktonic larvae are concentrated in nearshore waters and/or upper levels of the water column (to 60 m) for several months. After metamorphosing to juveniles and settling to the bottom, they inhabit shallow, nearshore areas. Adult shrimp, which are generally pelagic organisms, use coastal shallows for spawning. Planktonic shrimp larvae use surficial, nearshore areas for 2 to 3 months, and juveniles inhabit shallows before becoming semidemersal as adults. Bivalves occupy shallow shelf waters.

The projected level of seismic activity and the limited radius of effects would result in very low effects on planktonic and benthic organisms. Diluted discharges of an estimated 250 million bbls of formation waters, 190 thousand bbls of drilling muds, and 417 thousand bbls of cuttings from offshore locations in the planning area might cause lethal or sublethal effects on organisms using pelagic areas including scallops, adult shrimp, other invertebrates, and their planktonic food web organisms. These discharges, however, will affect only a small portion of these widespread populations, and could result in low effects on regional Shumagin area populations.

An offshore oil spill which did not contact important nearshore areas could result in limited mortality, primarily on adult (pelagic) shrimp and planktonic food web organisms. Even the assumed oil spill of 1,000 barrels or greater is expected to result in only a low effect on regional populations. An oil spill which contacted nearshore areas being used by planktonic eggs or larvae of shrimp, scallops, or other invertebrates could result in moderate impacts.

An oil spill which impacted nearshore waters could also affect the clam resources along the southern side of the Alaska Peninsula. Many razor clams were killed following the Amoco Cadiz tanker spill off the coast of France (USDOI, BLM, 1981a). In addition to the mortalities resulting from smothering or toxicity from an oil spill, chronic exposure of clams to hydrocarbons can result in the inability to attach to the substrate, a depressed rate of shell closure resulting in more vulnerability to predation, or inhibition of oxygen uptake (Dunning and Major, 1974). Numbers of surf clams could be reduced in localized areas as a result of an oil spill. The extent of such a reduction would depend on the concentrations of hydrocarbons to which the clams were exposed immediately, or on hydrocarbon concentrations that were incorporated into beach or benthic sediments and the length of time over which they were released because oil may persist in sediments and be released over a relatively lengthy time period (for example 6 to 12 years or longer [Gilfillan and Vandermeulen, 1978]). Long-term effects could result in localized areas. In addition, clam larvae are planktonic for 1 to 4 months before settling to the bottom, during which time they are particularly sensitive to hydrocarbons and are exposed to surface oil slicks. An oil spill that contacted nearshore surf clams could affect adult clams and planktonic larvae, and could reduce a portion of the regional population. Furthermore, these effects could take years to ameliorate because the species is long-lived and slow to reach sexual maturity (5 years or longer). However, only a portion of the regional surf clam population would be affected, so the effect on the regional population would be low in the event of an oil spill.

CONCLUSION: Impacts on planktonic and benthic life stages could be moderate locally. However, impacts of this action on regional populations are expected to be low.

CUMULATIVE IMPACTS: Activities which may produce cumulative impacts on planktonic and benthic organisms include other Federal and State ongoing and proposed petroleum development, commercial fishing operations, and other nonpetroleum industry activities.

Cumulative spill impacts tend to be greatest at locations where tanker traffic is concentrated (e.g., Unimak Pass, Balboa Bay). Tankering from existing and proposed leases in the Bering Sea increases effects discussed for the proposal because of the proximity to tanker traffic.

CONCLUSION: Areas along the southern Alaska Peninsula are expected to have low impacts from the proposal regionally, but may be moderate locally.

(b) Impacts on fish resources

The assessment of impacts on fish resources has been divided into sections on salmonids, herring, and crab.

Salmonids: On the southern coast of the Alaska Peninsula, salmon runs occur in the Stepovak and Chignik Rivers, streams on the Shumagin and Deer Islands, and streams into Balboa, Volcano, Canoe, and Belkofski Bays. Pink salmon is the major species on the southern side of the Alaska Peninsula. One assumed oil spill may impact nearshore areas while vulnerable life-stages of salmon are present, mortalities or sublethal effects could occur as discussed in Section IV.B.11.a.(4); however, an oil spill would affect only portions of the salmon populations on the southern side of the Alaska Peninsula and, at worst, would have a moderate effect on regional populations. Salmon are most vulnerable to oil spill effects in the Unimak Pass area because many use this pass during spawning migrations. Although the pass is approximately 80 kilometers wide, a spill in May to July resulting in high hydrocarbon concentrations in the immediate area could delay or alter migrations or result in exposure to sublethal concentrations.

Seismic activity has been found to be relatively harmless to fish in general. The peak pressure is relatively low and is distributed intermittently over short time periods (once every 5 to 10 seconds), with sound-pulse directions measured in milliseconds. Wienhold and Weaver (1971) exposed caged coho salmon smolt to varying airgun-pressure detonations at distances of 1, 4, and 5 meters from both a single airgun and a linear arrangement of eight airguns. No mortalities or injuries were observed during the 72-hour period following the testing. They concluded that airguns used in this configuration were non-injurious to coho of this size, but that more comprehensive studies were warranted. Falk and Lawrence (1975) exposed Arctic Coregonids (whitefish) to seismic airguns in the waters of the MacKenzie River Delta and found that the airgun has a potentially lethal radius of 0.6 to 1.5 meters under most conditions. Therefore, the projected level of seismic activity and the limited radius of effects would result in very low impacts on salmonids.

Diluted discharges of an estimated 250 million bbls of formation waters, 190 thousand bbls of drilling muds, and 417 thousand bbls of cuttings from offshore locations in the area could have a low effect on adult salmonids in pelagic areas. Drilling muds, cuttings, and fluids contain toxic components, including trace metals, biocides, and petroleum hydrocarbons in varying compositions and concentrations. Bacteriocides in drilling fluids (e.g., halogenated phenols, diomine salts, quarternary amines) can be quite toxic, having LC50 values of less than 1 ppm (USDOI, 1981). Toxicity bioassays for marine organisms exposed, in situ, to drilling muds and cuttings show relatively high LC50 levels. Salmonids had LC50's ranging from 4,000 to 190,000 ppm and shrimp showed an LC50 of 1,400 ppm (B.C. Research, 1976; Dames and Moore, 1978). Other LC50 values for species tested in the lower Cook Inlet COST well study including amphipods, mysids, isopods, and brine shrimp larvae ranged from 500-2,000 ppm (Dames and Moore, 1978).

Although drilling muds, cuttings, and formation waters may have potential lethal toxicities, there is considerable evidence that lethal concentrations are only present within a few meters of a discharge point and result in little mortality of marine organisms. Gerber et al. (1980) reported that lethal concentrations of drilling fluids would be present only within a few meters of a discharge. Therefore, these discharges will generally have very low impacts on salmonids.

CONCLUSION: Local impacts on prespawning adults, fry, and juveniles could be moderate. Overall, however, regional impacts of this proposal on salmonids are expected to be low.

CUMULATIVE IMPACTS: Activities which may produce cumulative impacts on salmonids include other Federal and State ongoing and proposed petroleum development, commercial fishing operations, and other nonpetroleum industry activities.

The proposed second Shumagin Planning Area sale could add to cumulative effects on salmon resources. However it is estimated that oil resources would increase only by 2 million barrels in the cumulative case. This is not enough oil to increase the number of spills assumed for the proposal nor to add to infrastructure or other impacting factors.

Along the southern side of the Alaska Peninsula, oil from existing and proposed Bering Sea sales tankered through Unimak Pass or from Balboa Bay, together with this proposal and potential production of State and Federal leases, increase the probabilities of one or more spills occurring.

CONCLUSION: Salmonid populations using areas in the vicinity of Unimak Pass and Balboa Bay could experience moderate impacts as a result of cumulative factors. Other areas utilized by salmonids in southern Alaska Peninsula area are not expected to experience greater impacts than the low.

Herring: The area includes some areas with concentrations of herring. Herring spawn in various bays on the southern coast of the Alaska Peninsula, including Canoe, Stepovak, Pavlof, Beaver, Coal, Volcano, Balboa, and Belkofski Bays. These spawning populations, however, are much smaller than those in the Bristol Bay/Togiak area, Port Moller, or Port Heiden.

The projected level of seismic activity and the limited radius of effects would result in very low effects on herring. Diluted discharges of formation waters and drilling muds, cuttings, and fluids from drilling platforms in the area could have a low effect on adult herring in pelagic areas. These discharges would have very low, if any, impacts on nearshore herring.

An oil spill which impacted nearshore areas being used by spawning adults, eggs, larvae, and juveniles could result in a moderate effect depending on the portion of a population present, the areal extent of the spill, the concentration of hydrocarbons, and the length of exposure. There is, however, a low probability (53%) of one or more oil spills resulting from this proposal.

Only an oil spill which exposed nearshore areas to lethal concentrations of hydrocarbons when vulnerable life stages were concentrated in those areas is expected to produce a moderate effect (i.e., affect a portion of a regional population). The aggregate lethal and sublethal effects of seismic activities, drilling and production discharges, and other oil spills are expected to affect only localized groups of herring in the immediate vicinity of such events. Given the extensive distribution and numbers of herring in the Gulf of Alaska and Bering Sea, the localized effects resulting from this proposal are not expected to result in a change in regional populations, and should result in a low overall impact.

CONCLUSION: Impacts on local populations of spawning adults, roe, larvae, and juveniles could be moderate. However, impacts of this proposal on regional populations of herring are expected to be low.

CUMULATIVE IMPACTS: Activities which may produce cumulative impacts on herring include other Federal and State ongoing and proposed petroleum development, commercial fishing operations, and other non-petroleum industry activities. The assumed number of oil spills increases from 1 to 2 in the Shumagin Planning Area as a result of including the effects of tankering through Unimak Pass and from Balboa Bay with the impacts of the proposal.

The proposed second Shumagin Planning Area sale could add to cumulative effects on herring resources. However, it is estimated that oil resources would increase only by 2 million barrels in the cumulative case. This is not enough oil to increase the number of spills assumed for the proposal nor to add to infrastructure or other impacting factors.

CONCLUSION: Regional herring populations could experience moderate impacts as a result of cumulative factors in comparison to the low impacts expected from the proposal.

Crab: Tanner, dungeness, and Korean hair crabs would be most seriously affected by an oil spill in a nearshore area that they were inhabiting. All lifestages of these crab species use nearshore areas at various times, and dungeness crab, in particular, occupy shallow waters (to 100 m) along the northern and southern coasts of the Alaska Peninsula during all lifestages. Adult tanner and Korean hair crab, which use nearshore waters for breeding in the spring and summer and for feeding (primarily females) prior to migrating offshore for the winter, could be affected by an oil spill. Adult dungeness crab occupy shallow waters year-round. Adult crabs could be killed by exposure to hydrocarbons in shallow waters. Crab eggs that are carried by females during feeding in nearshore areas also could be killed by contact with hydrocarbons, although specific LC50 values for this lifestage have not been established.

Post-molting tanner crab were observed to lose a number of legs following oil exposure and subsequently die an 'ecological death' being unable to survive in the normal environment (Karinen and Rice, 1974). Low concentrations of hydrocarbons can also result in reductions in fecundity (Tatem, 1977) or behavioral aberrations, such as the elimination of pheromone induced mating stances which can reduce reproductive success (Takahashi and Kittredge, 1973). Consequently, an oil spill in a nearshore area being used by breeding adults could result in moderate effects on crab species depending on the portion of a population present, the life stages present, areal extent of the spill, the concentration of hydrocarbons, and the length of exposure.

King crab at their current depressed population levels could be particularly vulnerable to moderate impacts. There is, however, a relatively low probability (53%) that one or more oil spills could result from this proposal.

Only an oil spill which exposed nearshore areas to lethal concentrations of hydrocarbons when vulnerable life stages were concentrated in those areas is expected to produce a moderate effect on a portion of a regional population.

The projected level of seismic activity and the limited radius of effects would result in very low effects on crab. Diluted discharges of formation waters and drilling fluids, muds, and cuttings from offshore locations in the planning area might cause lethal or sublethal effects on crab. These discharges, however, will affect only a small portion of these widespread larval drift populations, and could result in low effects on regional crab populations. An offshore oil spill which did not impact important nearshore areas would result in mortality and could result in a low effect on crab populations.

CONCLUSION: Impacts of this proposal on regional populations of crab are expected to be low. Impacts on a local population may be moderate.

CUMULATIVE IMPACTS: Activities which may produce cumulative impacts on crab include other Federal and State ongoing and proposed petroleum development, commercial fishing operations, and other nonpetroleum industry activities.

The oil spill risk in the area increases from 1 to 2 spills of 1,000 barrels or more including the effects of tankering from Balboa Bay and through Unimak Pass with the effects of the proposal. Cumulative spill effects tend to be greatest at locations where tanker traffic may be concentrated.

The proposed second Shumagin Planning Area sale could add to cumulative effects on crab resources. However, it is estimated that cumulative oil resources would only be 2 million barrels. This is not enough oil to increase the number of spills assumed for the proposal nor to add to infrastructure or other impacting factors.

CONCLUSION: Regional crab populations (particularly tanner and dungeness) experience moderate impacts as a result of cumulative factors in comparison to the low impacts expected from the proposal. Other areas along southern coast of the Alaska Peninsula used by crab are not expected to experience greater effects than the low impacts expected from the proposal.

(c) Impacts on marine mammals

Thirteen species of non-endangered marine mammals-sea otter, Pacific harbor seal, Steller sea lion, northern fur seal, killer and minke whales, Dall's porpoise, harbor porpoise, Pacific white-sided dolphin, short fin pilot whale, northern right whale dolphin, goosebeak whale, and giant bottlenose whale--commonly occur in a portion of or throughout the Shumagin Planning Area and are very likely to have some interaction with OCS activities. Oil pollution and disturbance due to increased human activity could affect marine mammal populations found in the area. The general effects of oil spills, noise and disturbance, and habitat alterations on marine mammals are discussed in Section IV.B.11.a.(4).

Several thousand sea otters present in scattered groups along the coast of the Shumagin Islands and occurring in concentrations around the Sanak Islands, Unimak Pass, and islands south of Cold Bay are the marine mammal populations at greatest risk from oil spills that may be associated with the proposal. If an oil spill impacted coastal or island nearshore habitats in the planning area, several hundred to a few thousand sea otters may be killed. This loss could represent a moderate to high effect because population recovery for scattered local groups of sea otters lost to an oil spill may take one generation or longer. Large numbers of sea lions and harbor seals could become contaminated if a spill contacted the Unimak Pass area or Sanak Islands or other important rookeries or haul out areas in the planning area-harbor seals and sea lions probably would not suffer high mortalities from oil spill contact with only weak individuals and perhaps young pups suffering serious effects. The one assumed oil spill may be likely to cause low effects on harbor seal and sea lion populations.

The northern fur seal is also likely to suffer no more than low oil spill effects from even a large spill in the Shumagin Planning Area because fur seals are widely distributed along their migration route during spring and fall migrations with animals swimming through the area in small groups and not in large herds. The migration through the planning area also occurs over several weeks; thus, large numbers of fur seals are not likely to come in contact with even a large oil spill which would become highly weathered and dispersed within ten days of the spill release. Although cetaceans could be exposed to an oil spill or gas condensates on the water surface or in the water column, only highly stressed individuals could possibly suffer serious sublethal effects from the probable, very brief exposure to concentrated hydrocarbons; thus oil spill effects on cetaceans in the Shumagin Planning Area are likely to be very low.

Harbor seals inhabiting major breeding and haulout habitats along the coast of the Shumagin Planning Area could be exposed to some noise and disturbance from the helicopter and support-vessel trips centered out of onshore support or development facilities at Cold Bay. Sea lions breeding in the Unimak Pass area and the Sanak Islands may be disturbed by some aircraft overflights. However, noise and disturbance from aircraft and vessel traffic would be very transitory and brief in duration. The frequency of disturbance is likely to be low and of little apparent consequence, unless pupping activities are disrupted. Disturbance of harbor seal and sea lion rookeries during the pupping season could significantly reduce pup survival.

The Marine Mammal Protection Act and other existing regulations could help to prevent excessive disturbance of harbor seals and other marine mammals. Thus, overall levels of disturbance effects are likely to be noise and disturbance from air and boat traffic and seismic-geophysical exploration activities associated with offshore oil and gas activities in the Shumagin area could cause brief startle, annoyance, and/or flight responses of whales, dolphins, and porpoises. However, present knowledge on cetacean behavior in association with industrial noise sources suggests that effects of disturbance on nonendangered cetaceans are likely to be very low. Construction activities associated with the proposal (installation of oil and gas platforms and offshore pipelines) are likely to have short-term or very low effects on marine mammals with any avoidance of drill platform sites or pipeline routes by whales or other marine mammals subsiding after construction activities are complete.

CONCLUSION: The proposed two OCS oil and gas lease sales in the Shumagin Planning Area could have moderate impacts on sea otters with probably low effects on pinnipeds and very low effects on non-endangered cetaceans.

CUMULATIVE IMPACTS: The additive impacts of other ongoing and planned projects, as well as the proposal, on non-endangered marine mammals are discussed in this section. Although the probability of any or all planned and ongoing projects reaching development stages is generally unknown, this analysis assumes that all the projects do reach development states. These projects could affect marine mammals by oil spills, noise and disturbance, and by habitat alteration.

Projects that could have cumulative impacts on marine mammals in the planning area include possible oil tankering through Unimak Pass associated with OCS leases in the Bering Sea, increases in other commercial fishing vessel traffic through Unimak Pass, possible oil tankering from Balboa Bay and other development facilities there that could be associated with northern Aleutian Basin oil and gas lease sales and commerical fishing activities in the Bering and North Pacific. Cumulative vessel traffic through Unimak Pass will increase the chance of vessel collisions and tanker spills or other hydrocarbon (fuel oil-bunker C oil) spills in the Unimak Pass and the Shumagin area. Oil spills in the Unimak Pass area would pose a serious threat to local sea otter populations and the 871,000 northern fur seals that migrate through the pass during the spring and fall. Although possible oil spills in Unimak Pass from cumulative tanker and other commercial vessel traffic would be rapidly dispersed and subject to evaporation and weathering, several thousand to perhaps tens of thousands of fur seals could come in contact with one or more oil spills in Unimak Pass and result in the death of several thousand to perhaps tens of thousands of fur seals. This could represent a moderate to high impact on the northern fur seal population. Oil spills that may be associated with cumulative marine traffic in Unimak Pass could also have moderate to high impacts on sea otters with the possible loss of several thousand animals. However, other pinnipeds and cetaceans are likely to suffer low to very low impacts from oil spills in Unimak Pass.

Noise and disturbance associated with increases in marine traffic and increases in aircraft associated with cumulative oil development and increases in the human population in Unimak Pass area would result in the temporary and perhaps long-term displacement of marine mammals, particularly seals and sea lions, from haulout sites and rookeries that are adjacent to air and/or vessel traffic routes. If the air and/or vessel traffic is frequent enough to cause long-term or permanent displacement of a portion of a species' regional population to a less favorable habitat (haulout-rookery site) impacts could be moderate to very high if a species' population was reduced and the recovery to its former level took 10 years or more. However, pinnipeds, and other marine mammal populations may habitiate to cumulative sources of noise and disturbance after perhaps a few years such that these effects are likely to be moderate.

Marine mammals could also be incrementally affected by changes in abundance and distribution of prey species due to commercial fishing in the Bering Sea and north Pacific, particularly if bottom fisheries are established in Alaska. Pinnipeds and otter species populations may suffer cumulative population declines associated with the loss of high numbers of animals entrapped in discarded fishing gear or losses from active gill net fisheries.

CONCLUSION: Cumulative impacts could be moderate on non-endangered cetaceans, fur seals, and sea otters occurring in the Shumagin area.

(d) Impact on coastal and marine birds

The effects of the one assumed oil spill on birds would vary with season, duration of exposure, and volume and composition of oil. Winter spills in the Shumagin area could affect overwintering cormorants, sea ducks, gulls, and alcids. In addition, fulmars, shearwaters, storm petrels, dabbling ducks, shorebirds, and alcids could be affected by summer spills. Loons, ducks, geese, shorebirds, and alcids would be the groups most adversely affected by spills during their spring and fall migrations. In August and September, large numbers of flightless adult and young murres and other alcids are concentrated on the water surrounding colonies prior to post-breeding dispersal. Embayments containing marshes or major river deltas, and nearshore areas where prey organisms are concentrated, are the most vulnerable habitats.

Seabirds are expected to be subject to high oil spill effects in the vicinity of large colonies in offshore islands (particularly Shumagin and the Semidi Islands) where tankers would pass in transit. During the nesting season, when large numbers of foraging birds are on the water, mortality resulting from a spill may exceed 15-20 percent of a large colony. Recovery from such an event could require 10 to 20 years. Water fowl and shorebird populations occupying lagoons and bays along the southern side of the Alaska Peninsula during spring and fall migrations are subject to moderate oil spill effects at these times. Effects on populations of most duck species using the lagoons are expected to be low, as a result of their more dispersed distributions and/or greater population size.

Small spills are most likely to be a problem near shore facilities and along tanker routes. Even small quantities of chronic oil discharges, in addition to accidental discharges, if they occur in an important marine bird concentration area, could have a detrimental effect on marine birds that utilize the area.

Numerous seabird colonies along the coast of the proposed area could be affected by increased air and boat traffic during OCS development activities. Large colonies on the Semidi, Shumagin and islands to the east, and other bird colonies in the area (such as Izembek Lagoon), could be subject to additional air traffic from OCS support activities. Such traffic could lead to reduced productivity and population reductions from disturbance. The responsive increase in gull populations to human development, and to associated increases in waste and garbage disposal sites, could have a significant adverse effect on other marine bird species.

CONCLUSION: Throughout most of the region, particularly in coastal and offshore island areas south of the Alaska Peninsula, or where large shearwater flocks occur, impacts on regional populations are expected to be moderate. Local populations could experience a high impact.

CUMULATIVE IMPACTS: The potential for cumulative impacts is most notable in coastal and offshore island areas from the Semidi Islands to Unimak Pass. If a spill occurred in this area in late spring, summer, or fall, marine bird populations, including those nesting in the adjacent eastern

Aleutians, could experience moderate to high impacts.

Most waterfowl and shorebirds are highly migratory and thus are not likely to migrate through, overwinter in, or nest near other State or Federal lease sale areas where they could experience adverse effects that might intensify any problems resulting from petroleum development in the Shumagin area. Additionally, several Alaskan goose populations (especially cackling Canada, brandt, emperor, and white-fronted) have undergone substantial population reductions as a result of continued intensive hunting pressure in both nesting and wintering areas, a reduction in winter habitat, and aircraft disturbance (particularly of brandt) in the vicinity of Izembek Lagoon. During spring and especially fall migration periods, hunting pressure may make these populations more vulnerable to oil in the environment. Other factors that may make a substantial contribution to cumulative effects include mortality resulting from seabirds accidentally captured in salmon driftnets, and reduction in prey availability. A combination of such factors could result in significant declines in regional seabird populations.

CONCLUSION: Where highly concentrated biological resources are coincident with high cumulative risk of oil spill contact or other adverse impacts, high impacts could be experienced by regional marine bird populations.

(e) Impact on Endangered and Threatened Species

Endangered species known to occur in or adjacent to the planning area are the same as found in the Kodiak Planning Area. There is a possible nesting area in the Semidi Islands of the Aleutian Canada goose but FWS has not completed this data analysis yet. There are no listed plant species in areas adjacent to the planning area. Refer to Section IV.B.11.a.(4) in this document and Sale 92 FEIS for more specific details on potential effects on endangered and threatened species that may occur as a result of oil and gas activities in this planning area. No sales have been held in the Shumagin area, therefore no endangered species consultation or biological opinion has been rendered for this area to date. An opinion will be given at the time the sale specific EIS is done. For a discussion of the consultation process, see Chapter V.

Two sales are proposed for this area over the five year period. There is a three percent marginal probability that 48 MMbbls will be discovered in this area. If this amount of oil is discovered, up to 30 production and development wells will be drilled from one platform. One oil spill could occur being 1,000 bbls or more. Oil will be piped to a new landfall base in Balboa Bay and then tankered directly to market. If a spill was to occur in the nearshore area of the planning area, migrating whales could be contacted. Short-term results of this interaction could include baleen fouling, death of prey items and possible avoidance of the spill area, potentially lasting beyond the spill duration. Although one spill is assumed, the size of the spill area will be limited primarily by the volume spilled (a 10,000 bbls spill would spread to 100 sq.km. with a patchy distribution). Aleutian Canada geese landing on such a slick could foul their feathers and eggs, possibly resulting in the death of the adults and eggs/newborn chicks. If short-tailed albatross were to land on oiled waters, effects would be the same as described for marine birds in Section IV.B.11.a.(4).

Noise disturbance associated with the proposal would include seismic activity, and vessel and air support traffic. These activities would occur twice as often as in the Kodiak Planning Area due to two sales proposed over the five years. These noise-producing activities are likely to ensonify areas which previously had levels only slightly above ambient. Whale reactions to noise levels range from no discernible reactions (low noise levels) to active avoidance and abandonment of use areas (high noise levels). Noise-producing activities are most likely to occur in localized areas and along specified corridors. Annoying noises bisecting whole migration routes could result in alterations of their historic routes, timing delays and abandonment of spring feeding areas. Effects are likely to be most pronounced in those whales in nearshore waters (gray, humpback, sei, fin and possibly right).

Although whale distribution in the planning area is generally widespread along the eastern areas, a narrowing of migratory routes occurs as the whales near Unimak Pass. If all activities associated with development/ production occur, endangered whales could have moderate effects associated with the proposal. However, there is a very minimal probability (three percent) of oil discovery so most likely effects would probably not exceed low. Land noises near nesting areas are potentially destructive.

CONCLUSION: Impacts from the proposal are not expected to exceed low for endangered whales and the Aleutian Canada goose. Impacts to the short-tailed albatross are expected to be very low.

CUMULATIVE IMPACTS: Cumulative impacts will occur primarily from the expanded use of Balboa Bay by several sales proposed (all Bering Sea sales) transportation scenarios. Large tankers have the potential to ensonify large underwater areas. As more tankers use Balboa Bay, the frequency of trips will increase as will the probability of oil spills occurring. If habituation to noises associated with oil and gas activities occurs, it will take many years and possibly may not occur. The increases in noise disturbing activities, possible habitat alteration and exposure to oil spills could result in moderate impacts on a long term basis. On a cumulative basis, the Aleutian Canada goose could experience low impacts and the short-tailed albatross very low impacts.

CONCLUSION: The inclusion of this planning area would result in oil and gas activities which are expected to be moderate for endangered whales, low for the Aleutian Canada goose and very low for the short-tailed albatross.

(f) Impact on estuaries and wetlands

These topics are discussed and impacts analyzed where they occur as habitat for the fish and wildlife species in (4)(a) through (4)(e) in this section.

(g) Impact on areas of special concern

These areas are all habitat for the fish and wildlife species in (4)(a) through (4)(e) and impacts are discussed as they occur in the planning area.

(h) Impact on Marine Sanctuaries

There are no Marine Sanctuaries in the Alaska OCS Region.

(5) Socioeconomic Environment

(a) Impact on employment and demographic conditions

The proposal could result in a pipeline landfall and oil terminal at Balboa Bay, on the south side of the Alaska Peninsula. The nearest community is Sand Point. The air support base could be in Cold Bay. The marine support base could be Sand Point.

The search for and discovery of oil and gas within the Shumagin Planning Area could create employment opportunities and consequently increase population levels. These changes have both positive and negative attributes, thereby giving an indication of the socioeconomic well being of communities of the State or regions within the State.

This proposal could generate a region-wide total of up to 250 new jobs during peak activity. This is based on estimates made in past EIS's for the Alaska OCS Region for similar activities in similar areas. The bulk of the jobs (perhaps 90+%) will be filled by workers living in enclaves near the job site or on the exploration or production platforms.

The general pattern of Alaskan OCS activity is one of small employment effects in the exploration phase and fairly large effects during the development phase (starting in 2000) with most jobs in both the exploration and development phases filled by commuters living in the petroleum industry enclave onshore (Balboa Bay) or on the exploration or production platform. By contrast, it is expected that the moderate number of new jobs created during the production phase (starting in 2000) would be filled somewhat by permanent residents of a community.

A State-wide peak population increase of about 130 persons could be associated with the projected employment increase. Of that number, a small proportion may live in a small town or village associated with development activity. The bulk of the new population (families of enclave living workers) could live in Anchorage, the Matannuska Valley or on the Kenai Peninsula. Impacts are potentially more significant in those areas of small present population near which offshore-related activities may be located.

For the planning area, Sand Point and Cold Bay are the towns that may be affected. Because of the small number of new jobs and population, anticipated impacts are expected to be low on a regional basis. Impacts at any one of the named villages could be moderate during an influx of population depending on timing and duration.

CONCLUSION: Impacts to employment and demographic conditions would be low regionally. Impacts could reach a moderate level on a local basis.

CUMULATIVE IMPACTS: Cumulative effects of Federal oil and gas development in the Shumagin Region plus the State-generated activities could substantially increase regional employment and populations. Because of the size of the Alaskan planning areas and the wide distances between coastal villages, local employment and population growth will more nearly follow estimated employment and population growth figures for the planning area rather than experience much growth on a cumulative basis.

CONCLUSION: Cumulative employment and subsequent population growth will be moderate.

(b) Impact on coastal land use

The effects on land uses and existing plans would be primarily associated with the following types of uses: (1) siting of onshore developments serving offshore leases (air- and marine-support bases, marine terminals, and pipelines); (2) land demands resulting from increased residential populations; and (3) effects on existing land uses such as subsistence activities and recreation and tourism.

Cold Bay has been indicated as a potential air-support site due to its superior airfield facilities. A small support-base facility, encompassing about 4 acres, could be constructed near the airport. Such a facility could include a hanger-warehouse complex, offices, and a helipad.

OCS-generated population increases could require about 4 acres of land for housing the additional population. Although little land is available for development, land necessary for residential needs should pose few problems. Reduced operations by several major companies and agencies and resultant populations would create an oversupply of housing which could be used by OCS-generated populations. Also, current negotiations among the City of Cold Bay, the U.S. Government, and the State of Alaska are expected to result in the city acquiring at least 1,000 acres by the turn of the century.

Similar amounts of land could be required in Sand Point if it is selected as a marine terminal. It is expected that this amount of land would be available within or near the city.

The marine terminal, LNG plant and oil pipeline landfall at Balboa Bay would be outside the Alaska Peninsula refuge on land selected or conveyed to the Native corporations. As a result, the decision to build these facilities would be largely up to the Native landowners (USDOI, FWS, 1984).

The effects of potential lease sales on the land uses of the affected areas are expected to be minimal. Marine and air support efforts for all phases of petroleum development produced by this action are expected to be minimal. The requisite infrastructure necessary to develop 48 million barrels of oil and 1,363 billion cubic feet of natural gas is also expected to be minimal. Indeed, the required facilities should already be existing as a result of OCS activity at Cold Bay (air support), Sand Point (marine support) and possibly at Balboa Bay, a product storage and transshipment terminal.

CONCLUSION: Land use impacts are expected to be low.

CUMULATIVE IMPACTS: Considered in a cumulative case, the resources and impacts of the proposed sales in the Shumagin Planning Area become virtually negligible. Existing infrastructure should absorb forecast activities without causing an additional effect on the region's land use patterns.

The expansion of the Cold Bay airport should not create a substantial effect on other land uses. The areas proposed for expansion are not suitable for other forms of land use (e.g., residential, commercial, industrial). Expansion of the airport could bring more traffic to the area, thus creating secondary demands for land to be used as residential, commercial, or industrial space. The same would probably apply to the land needed in Sand Point but to a lesser degree because only activities in the Shumagin Planning Area would cause a cumulative effect. An increase of only 2 million additional barrels of oil are expected in the cumulative case.

CONCLUSION: Cumulative impacts should be low.

(c) Impact on commercial fisheries

The commercial fisheries of the area are of three political-economic designations: (1) domestic, (2) foreign, and (3) joint-venture. Approximately 9% of the total Alaska fisheries harvest comes from the Shumagin Islands area. Domestic Shumagin fisheries are mostly coastal. There are distinct fisheries for dungeness crab, king crab, tanner crab, shrimp, scallops, salmon, herring, and halibut. Each fishery has its own set of regulations. Salmon dominate harvests in the Gulf of Alaska with pinks forming the bulk of the catch. Herring, halibut, sablefish, crab, and shrimp are also fished. Typically, more than 80 percent of the salmon are taken by seiners. Shellfish follow in order of magnitude and value, then herring and halibut.

The Shumagin area could be affected by oil development, principally through a large oil spill of some duration polluting critical nearshore fisheries habitat and more so, during the early pelagic life (egg and larval) stages. However, there would be only very low effects on populations supporting commercial fisheries.

Secondary effects on fishing would be to gear (mainly crab pots). This effect would be very low given the limited area fished and the seasonality of these fisheries and the recent oil/fish industry coordination effort.

Commercial fishing might also be adversely affected by these oil spills fouling fishing gear and/or flavor-tainting its catch and concurrent lost fishing time. The fishing industry could be compensated for these losses through the provisions of the Offshore Oil Pollution Compensation Fund (33 CFR, Parts 135136). A self-replenishing fund of $100,000 for each OCS area has been established; however, claims are not limited to this amount. Regulations now in effect have reduced the former overly-long claim-processing time. For details regarding this fund, see Alaska OCS Technical Paper No. 4 (Casey, 1981).

Lost fishing time in the Shumagin area may result from the time required to replace or clean and repair oil-fouled gear. Lost fishing area could result from placement of structures, including pipelines, in fishing areas, especially where trawl fleets operate and oil development might also interfere with fishing vessel traffic.

Loss of fishing area through the presence of one offshore platform and 2 pipelines is assessed as low. If it is assumed that one exploratory rig would be operating in the area, and that an exploratory platform preempted a 1,000-meter radius around the platform from any fishing activity; then approximately 6.3 square kilometers would be preempted at any one time in the entire area during exploration. If the same assumptions are used for the one development platform, then approximately 6.3 square kilometers would be preempted. If trawlers avoided pipelines using a 500-meter buffer on either side of the pipeline, then about 50 square kilometers would be lost to fishing. Therefore, the total area that could be lost to trawling for pelagic and demersal fish (groundfish) would be 6.3 square kilometers during exploration and 50 square kilometers during development and production. Since this represents a relatively small area relative to the large area used by both foreign and domestic trawlers in this region, only low effect to commercial fishermen is expected, even if harvest losses were conservatively estimated as being proportionate to the total area preempted.

CONCLUSION: Impacts on the regional fishing industry from the proposed action could be low.

CUMULATIVE IMPACTS: Other Federal lease sales off the Alaskan coast, primarily in the Bering Sea, could increase impacts on the fishing industry in the Shumagin area. The principal effect would result from an unknown amount of tanker traffic from these areas in transit through this lease area. State oil and gas lease sales in upper Cook Inlet would maintain the present rate of tanker traffic through the area for a longer (up to 20 plus years) time.

Vessel traffic other than oil- and gas-related transport is projected to increase in the lease area as the population of Alaska increases--another cumulative cause. The increase in U.S. groundfishing (up to 40 boats in Kodiak) could increase traffic impacts in the future. The impact of these continuing or increasing transportation efforts could be increased conflicts between fishing vessels and other ships and could affect docking, harbor, and supply needs.

CONCLUSION: The cumulative impact on the regional commercial fishing industry is expected to remain low, as for the proposal.

(d) Impact on recreation and tourism

Most effects on recreation and tourism would be changes in economic values and noneconomic qualities. Changes in the number of users, property values, and visual qualities are examples. There is no previous FEIS for this area. There could be changes in wilderness qualities because of the appearance of oil platforms in the area. The hazards of shipping oil would result in some risk to recreational beaches and fishing areas at the outlets of rivers and streams. Cleanup of oil spills would result in some disturbance to recreational beaches. All of these effects would be low because of the procedures usually followed during leasing and development. Such procedures are regulated by laws which have been listed in previous EIS's (See Sale 83, 88, and 89 FEIS's, Section IV.)

The Shumagin lease area is expected to produce 48 billion bbls of oil and 1,363 billion cubic feet of gas. The probability of hydrocarbons is 0.03. Based on these figures, one spill greater than 1,000 barrels is expected to occur during the lease period.

CONCLUSION: Impacts on recreation and tourism would be very low.

CUMULATIVE IMPACTS: Cumulative effects on recreation and tourism are caused by similar factors to those given in the Final Supplement to the Final EIS, Proposed Five Year OCS Oil and Gas Lease Sale Schedule for January 1982-1986 (USDOI, MMS, 1981).

CONCLUSION: The cumulative impacts are low.

(e) Impact on archaeological resources

There may be archaeological resources onshore of the lease area, particularly at the heads of bays. The offshore area has few existing landforms which could have survived the currents and wave action. Shipwrecks of the Balboa Bay area may be disturbed by increased interest in the area and the several shipwrecks in the area might be located as a result of exploration activities. Existing laws and regulation protecting both onshore and offshore resources would prevent disturbance in most cases. The MMS procedures could require consultation with both Federal and State Historic Preservation Offices through mitigating measures prior to any exploration or development.

The Shumagin Planning Area is expected to produce 48 billion bbls of oil and 1,363 billion cubic feet of gas. The probability of hydrocarbons is 0.03. Based on these figures, one spill greater than 1,000 barrels is assumed to occur during the lease period.

It is likely that unique archaeological or historical resources exist within the area and may be disturbed, resulting in minimal loss of data;

and also non-unique archaeological or historical resources exist which may be contacted or disturbed, resulting in loss of data which may be equally obtainable from other sources.

Effects on archaeological resources would result from disturbance to underwater landforms, shipwrecks, and historic sites. Onshore prehistoric and historic sites are likely to be affected by increases in industrial populations which in visiting the site accidentally disturb it.

There were nine ships wrecked among the islands near Balboa Bay in the early 1900's that could be affected by the proposal. In addition, workers on the OCS may be involved in such activities as commercial and amateur diving.

Oil spills would indirectly affect onshore cultural resources in the following manner: bulldozers, trucks, and other heavy equipment may be moved to the oil spill cleanup area from an airport in the vicinity of the spill. Therefore, oil spills would affect onshore cultural resources or other cultural resources, such as shipwrecks, because of the use of cleanup equipment transported over archaeological sites during cleanup. Such effects would be moderate if the contact were made.

Oil spilled on archaeological sites has little effect on radio-carbon-dating, since methods have been devised to distinguish radiocarbon dates of oil from the archaeological radiocarbon dates. The effect of spilled oil on archaeological material is therefore low.

CONCLUSION: The impacts are expected to be low.

CUMULATIVE IMPACTS: The cumulative effect on archaeological resources is caused by similar factors to those given in the Final Supplement to the Final EIS, Proposed Five Year OCS Oil and Gas Lease Sale Schedule for January 1982-1986 (USDOI, MMS, 1981).

When federal projects in other more northern lease areas occur, increased tanker, workboat, and aircraft traffic would result. This increased activity and population would increase risk of damage to cultural resources because significant contacts could occur at the Unimak Pass blocks and/or at locations of support and development facilities near Herendeen and Balboa Bays. State sales in the Kuskokwim (southwest Bristol Bay uplands) could also affect cultural resources. Except for some increased tankering through Unimak Pass or from Balboa Bay, cumulative activities will remain low for the Shumagin area.

CONCLUSION: The cumulative effects are low.

(f) Impact on transportation systems

The transportation systems impacts of the proposed action on the infrastructure of the Shumagin region is expected to be minimal. The Cold Bay air field would already have been the site of support activities relevant to previous OCS lease sales who's level of associated operations would have been much in excess of that forecast for the proposed action. In regard to marine support, the community of Sand Point is likely to be the site of a small support base at least through the exploratory phase. Vessel operations should average less than 30 per month as it is assumed that only one rig at any moment would be in operation. Should a recoverable quantity of hydrocarbons be located, it is probable that support operations would be moved to a new processing terminal at Balboa Bay.

CONCLUSION: Impacts of proposed action are expected to be low.

CUMULATIVE IMPACTS: Given the level of activity (one platform) that the subject support facilities will be exposed to over the next decade, the impacts of the proposal will be low. Cumulative tanker trafic through Unimak Pass and therefore through the western edge of the Shumagin Planning Area from all contributory sales could exceed 350 loaded vessel trips (700 total trips) during the life of the proposal. This addition would more than double the larger vessel traffic using the pass. In this case only the cumulative effects could be considered high. However, traffic levels within Unimak pass are currently under review by the Coast Guard. If it is determined that a vessel-traffic-separation system is needed for the Unimak Pass area, the Coast Guard will implement this system, and thus reduce the potential for future vessel conflicts.

CONCLUSION: The cumulative impacts could be low except for the Unimak Pass area where they could be high.

(g) Impact on military uses

This is not a subject discussed in the Alaskan OCS Region as there are no restricted areas.

(h) Impact on subsistence-use patterns

Although the subsistence patterns vary, salmon for subsistence purposes are generally taken with the same gear used for commerical fishing, or they may be taken from the commercial catch. Therefore, potential effects on salmon and salmon fishing could affect both commercial and subsistence harvests which are of primary importance.

One spill of 1,000 barrels or greater would be expected. Subsistence resources used by the residents of Sand Point would be the ones most likely to be disturbed.

Subsistence-use patterns (caribou and salmon) at Sand Point could be affected if the Alaska Peninsula LNG terminal were to attract service industries, Coast Guard-family housing (as in Valdez), or migrants attracted to the community in hopes of finding work. The level of effect from population increases, however, should be minimal. Salmon and other marine subsistence resources are relatively plentiful and potentially not subject to harvest conflict. Terrestrial wildlife, especially moose and caribou, must be hunted on the mainland, a condition which should limit access to such resources due to the transportation costs involved.

Residents normally fly or use the family fishing vessel for such excursions, whereas newcomers would likely have less access due to the level of technology owned or discretionary income available. The LNG terminal facility could pose a certain level of risk to marine resources near Sand Point from chronic discharges, such as from a ballast-treatment plant. However, such effects should be minimal in comparison with the potential risk that could be posed by an oil-shipment point.

The enclave population at Balboa Bay for the LNG plant and gas pipeline should effect little change in subsistence-use patterns in Sand Point and Cold Bay due to the character of the harvest and the relative abundance of the resources available for harvest.

Subsistence-use patterns in Cold Bay are not expected to undergo a material change from those brought about by the normal growth of the community, let alone from OCS-related air operations, due to the relative abundance of local resources combined with the limited subsistence practices carried out in the community.

CONCLUSION: The overall effects on subsistence in the planning area would be low.

CUMULATIVE IMPACTS: Increased air and marine traffic in Cold Bay and Sand Point and tankering of crude to and from a major oil terminal on the Alaska Peninsula could increase the threat of disturbance, interference, and oil spills on the subsistence resources used by the residents of the planning area. The marginal increases in traffic would have low effects on subsistence around Sand Point and very low effects around Cold Bay.

As an outpost for metropolitan functions, Cold Bay has no deep historical tradition in subsistence practices and should experience little change in currently practiced subsistence-use patterns. These consist primarily of some set-netting for salmon, setting a crab pot, or beachcombing. The added population associated with OCS air support and a southern Alaska Peninsula oil and gas terminal may cause the need for added regulation because of increased harvest pressure, but these should primarily regulate sport hunting and fishing, since this is the primary resources-harvest pattern in the community. The rich level of resources abundant near the community, however, suggests that such effects should be minimal.

Elsewhere on the Alaska Peninsula, the case may be similarly true despite the much more entrenched subsistence tradition. The much higher density of use of Balboa Bay for transshipping oil as well as LNG product increases the likelihood of oil spill risk to marine subsistence resources on the southern coast of the Alaska Peninsula. The increased risk from oil spills at the Balboa Bay terminal site from incoming and outgoing tankers could have direct effects on subsistence resources and resulting subsistence-use patterns at Sand Point. Subsistence-use patterns at Sand Point also may be subject to change from the effects of increased population associated with increased activities at the terminal. Such effects could include more restrictive harvest regulations due to increased harvest pressure. At False Pass and King Cove, subsistence-use patterns likewise may be affected, but less by increased population than by the increased shuttle-tanker traffic travelling through Unimak Pass to the terminal, to the extent comparable to the level of the effect forecast for the terminal site.

CONCLUSION: The cumulative effect of oil spills and other industry activities could result in moderate effects on subsistence in the planning area.

(i) Impact on sociocultural systems

Two sales are scheduled for this area. This area is dominated by Aleut cultural systems and fishing economies. Since anything more than short exploratory work is unlikely, sociocultural effects are expected to be very low.

Siting an oil and gas terminal in Balboa Bay could intensify changes already occurring in Sand Point as a result of population growth due to groundfish industry development. The social organization of Sand Point could be altered somewhat due to population growth, creating a more diversified and stratified community as well as creating a decrease in the ability to depend on the kinship structure for a support network. The current trend toward displacement of Aleut cultural values and orientations is expected to continue as the population grows and more employment opportunities become available. This trend could be intensified somewhat with the proposal, although the effects would be low in view of the changes already occurring in the development of the groundfish industry at Sand Point.

Expected economic effects include increases in the job totals for Sand Point and Cold Bay, but no decline in joblessness in those communities.

Effects of the proposal on the sociocultural system of Sand Point are expected to be minimal and marginal compared to the effects of growth conditions expected to be created by fisheries-oriented industrial development. In Cold Bay, the more than doubling of resident population would produce a long-term prospect for disruption of sociocultural systems within the community, but which are generally void of structural implications. The character of population and employment relations associated with activities are compatible with the historical, social, and cultural experience of the community, whereas the political system of organization would be subject to considerable stress in attempting to develop and carry out growth-management policies.

On the Alaska Peninsula, the population growth and economic activity associated with the operation of the LNG terminal at Balboa Bay could cause change in Sand Point to the extent of creating a more diversified and stratified community and perhaps hasten the trend toward displacement of traditional cultural values and orientations underway from the monetization of commercial fishing. Political ramifications could ensue locally and in the region from attempts to appropriate the terminal as a tax base, but such effects should be on short-term duration.

Because unemployment is believed to be extremely low among permanent residents of Sand Point/Dutch Harbor, it is doubtful that the proposal would decrease joblessness in the community. However, because petroleum industry jobs generally pay well, it is possible that average incomes in the community would be increased slightly as a result of the proposal. Possible negative economic effects could include crowding of port facilities, a slightly increased rate of price inflation, and housing shortages. Any effect on price levels probably would be limited to prices charged by hotels, restaurants, and bars, and to residential rental rates. Any damage which petroleum development might cause to the fish, fishing gear, or both marine resources of the region could result in economic loss to residents of the community.

CONCLUSION: Sociocultural impacts are projected to be very low.

CUMULATIVE IMPACTS: Tankering traffic should bypass most of this area, should OCS development in the southern Bering Sea occur and tankers pass through Unimak Pass on their way south. Since this and adjacent areas are relatively unlikely to experience more than minimal exploratory drilling, cumulative impacts on local sociocultural systems are expected to be very low.

CONCLUSION: Cumulative impacts are expected to be very low.

b. Unavoidable Adverse Impacts

Section IV.B.11.b. presents a discussion of the unavoidable adverse impacts of the proposal for all Alaskan planning areas.

c. Relationship Between Short-term Uses of the Environment and the Maintenance and Enhancement of Long-term Productivity

Section IV.B.11.c. presents a discussion of the relationship between short-term uses of the environment and the maintenance and enhancement of long-term productivity attendant to the proposal for all Alaskan planning areas.

d. Irreversible and Irretrievable Commitment of Resources

Section IV.B.11.d. presents a discussion of the irreversible and irretrievable commitment of resources attendant to the proposal for all Alaskan planning areas.

e. Environmental Impacts of a High Case Scenario

This section provides a discussion of the potential environmental impacts that could occur in the unlikely event that all unleased, undiscovered, economically recoverable hydrocarbon resources in the Shumagin Planning Area are leased and developed as a result of the proposal. The estimated high case hydrocarbon resources for the Shumagin Planning Area are: 50 million barrels of oil and 1,420 billion cubic feet of gas. These estimates are slightly higher than the base case for the proposal (48 MMbbls oil and 1,363 BCF of gas). However, infrastructure expected to be used to explore and develop these resources includes 9 exploration and delineation wells, 30 development wells and one platform. This is the same as the proposal. In addition, the estimated number of oil spills greater than 1,000 barrels remains at one the same as the base case proposal.

It is important to point out that the Shumagin area does not have existing offshore development. Resource estimates and infrastructure for the high case are the same as the cumulative case. However, the high case assumes that the resource will be developed as a result of the proposed 5-Year program lease sales, while the cumulative case assumes that leasing and development will extend over the future 5-year programs lease sale.

Impacts to all resource categories analyses may increase slightly, however, the differences in impacts cannot be differentiated from those described for the base case for Alternative I because of the very slight difference in oil and gas resources.

f. Impacts of Alternative II - Subarea Deferrals

This alternative evaluates the possible deferral of 13 subareas. These are in addition to the 14 subareas deferred under Alternative I. None of the additional subarea deferrals included in Alternative II are within this planning area, therefore, the expected environmental impacts of Alternative II in this planning area are identical to the expected impacts of the proposal.

g. Impacts of Alternative III - Add a Sale in the Straits of Florida

Adding a sale in the Straits of Florida Planning Area will not effect this planning area. However, under Alternative III, all sales proposed in Alternative I - the proposal, would be held. Therefore, the expected impacts of Alternative III are identical to Alternative I for this planning area.

h. Alternative IV - Biennial Leasing

Because no difference in number or timing of sales is anticipated for this planning area between this alternative and the proposal, there will be no change in impact levels for the resources analyzed in the physical, biological and socioeconomic environments.

i. Alternative V - Acceleration Provision

Because no difference in number of sales or timing is anticipated for this planning area between this alternative and the proposal, there will be no change in impact levels for the resources analyzed in the physical, biological and socioeconomic environments.

j. Impacts of Alternative VI - Defer Leasing in Six Planning Areas:

North Atlantic, Washington and Oregon, Northern California, Central California, Southern California, and North Aleutian Basin

Selection of Alternative VI would defer leasing in the North Aleutian Planning Area (Alaska Region). Selection of this alternative could result in lowering cumulative impacts because the pipeline across the Alaskan Peninsula may not be built (unlikely because of previous sales). Also, oil and gas from the second sale in the North Aleutian Planning Area would not be shipped from the terminal site at Balboa Bay.

There would be some lessening of cumulative impacts because 173 MMbbls of oil would not be tankered through the Shumagin Planning Area. Marine birds and mammals, fish and subsistence resources would be the primary resource categories to benefit from this alternative.

k. Impacts of Alternative VII - No Action

Under this alternative, the Secretary of the Interior would propose not to schedule any oil and gas lease sales for this proposed 5-year program. All potential impacts from OCS oil and gas activities to the physical, biological, and socioeconomic environment resulting from hydrocarbon exploration, development, and production would be eliminated.

Oil and gas are currently the nation's primary energy source. Even with a vigorous conservation program the United States' demand for energy will continue to grow. With the adoption of Alternative VII, the oil and gas that would have been available as a result of this proposed program would no longer contribute to the national domestic production during the life of the program.

With the removal of the potential oil and gas into the national energy reserves, it would necessitate the increased production of energy from other conventional and non-conventional energy sources (see Appendix C), and/or increases in import levels from foreign sources. Impacts resulting from the development of the alternative energy sources are summarized in Section II.A.7 and discussed further in Appendix C.

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15. North Aleutian

a. Alternative I

The proposal includes the holding of 1 sale in the North Aleutian Basin planning area. It is estimated that the sale will produce about 173 million barrels (mmbbls) of oil and 1,258 billion cubic feet of gas over a 35 year period. These resources will be produced from 39 production wells from 1 platform. In addition to the oil and gas, up to 330 mmbbls of formation water could be produced. Approximately 382 thousand barrels of drilling muds and fluids and 426 thousand barrels of drill cuttings could be discharged into the sea over the life of the proposal. About 12 exploration wells will be drilled. It is anticipated that 1 support base will be expanded and that at least 1 onshore facility will be expanded.

(1) Interrelationship of Proposal With Other Projects and Proposals

Section IV.B.11.a.(1) presents a discussion of the interrelationships of the proposal with other projects and proposals for all Alaskan planning areas

(2) Projects Considered in Cumulative Impact Assessment

The following activities will cumulatively effect the Shumagin, North Aleutian, St. George, Navarin, and Norton planning areas. Federal oil and gas lease sales in the Bering Sea region which could contribute to cumulative effects are the St. George Basin (Sale 70), the Norton Sound (Sales 57 and 100), the Navarin Basin (Sale 83), and the North Aleutian Basin (Sale 92).

- St. George Basin (Sale 70): The St. George Basin sale was held April 12, 1983, with 96 blocks being leased out of 479 blocks offered. Potential cumulative effects could result from the use of Cold Bay, St. Paul, and Unalaska as support-base sites, and from oil spills, transportation of hydrocarbons by tankers, the drilling of wells, and the placement of platforms.

- Norton Sound (Sale 57): The Norton Sound Sale was held March 15, 1983, with 59 blocks being leased out of 418 blocks offered. Cumulative effects potentially could include the transportation (tankering) of hydrocarbons during the production phase and from any potential oil spills.

- Norton Sound (Sale 100): The Norton Sound DEIS was released in March 1985. Based on the Exploration and Development Report (USDOI, MMS, October 1984), the area is assumed to have 282 MMB of oil and 1.552 TCF-gas. Based on the development scenario, cumulative effects could include the transportation of hydrocarbons (by tanker), oil spills, and the development of a transshipment terminal on the south side of the Aleutian Peninsula.

- Navarin Basin (Sale 83): The Navarin Basin Sale was held April 17, 1984 with 163 blocks being leased out of 5,036 blocks offered. The probable evironmental effects are based in part on the assumption that a resource that a level of 1.5 billion barrels of oil would be discovered and produced. Based on the development scenario, cumulative effects could include using Cold Bay and Unalaska as support-base sites, transportation of hydrocarbons (by tankers), oil spills, and the development of a transshipment terminal on the southern side of the Alaska Peninsula.

- North Aleutian Basin (Sale 92): The North Aleutian Basin Final EIS was released in September 1985. The area is assumed to have a resource level of 279 MMbbls of oil and 2.10 TCF of gas. Based on hypothetical exploration, development, and production activities, cumulative effects could include the use of Cold Bay and Unalaska as support bases, the drilling of wells, the placement of platforms, the development of pipelines, and the development of a transshipment or offshore loading terminal.

Sale 89, St. George Basin is also included in the Department of the Interior's present 5-year schedule for Alaska.

Sales in the proposed 1987-91 5-year schedule could, if oil and gas is produced, have additional cumulative effects.

The following proposed State of Alaska oil and gas sales could also contribute to cumulative effects.

- Bristol Bay Uplands (Sale 41): In September 1984, the State of Alaska held an oil and gas lease sale for the Bristol Bay uplands. The Sale area containing about 4 million acres is located south of the Kvichak River and north of Port Heiden on the Alaska Peninsula. Of the 1.4 million acres offered 278,938 acres received bids. The State does not plan to lease tide and submerged lands south of Cape Menshikof to Unimak Pass for oil and gas exploration until at least 1994.

- Alaska Peninsula (Sale 56): The proposed sale area contains about 1 million acres on the northern side of the Alaska Peninsula between Liesko Cape and Port Heiden. No decision has been made on whether to hold the lease sale, however; the Call for Comments will be distributed in July 1986.

Tankering of Canadian Oil: The Geological Survey of Canada estimates the Mackenzie Delta/Beaufort Sea oil reserves to be 9.2 Bbbls. (Oil and Gas Journal, 1994). Current development strategies of Canadian oil companies and Canadian government regulations will require that initial shipments of any of this oil be made to Canadian users, in effect to the Canadian West Coast via the Northwest Passage. However, starting no sooner than 1990, but continuing for the remaining life of the Canadian Beaufort Sea fields, it is hypothesized that one tanker per week might be routed westward through the U.S. Beaufort, Chukchi, and Bering Seas to Asian markets, for a total westward tankering of a potential 1.7 Bbbls.

(3) Physical Environment:

(a) Impact on Water Quality:

In the North Aleutian Basin, anchoring of exploration rigs (12) and one production platforms and entrenchment of pipelines would increase turbidity only temporarily over a limited area. Discharges of drilling fluids (382,000 bbls of drilling mud and up to 330 mbbl of formation waters) from 12 exploration rigs and one production platform would contaminate less than 1 square kilometer. Production, but not exploratory, discharge would continue intermittently over several years. A single oil spill of 1,000 barrels or greater is assumed and could significantly, but temporarily, increase water column hydrocarbon concentrations over several hundred kilometers. See Section IV.B.11.a.(3) for specific impact discussions.

CONCLUSION: Effects on water quality from the proposal would be low.

CUMULATIVE IMPACTS:

Cumulative effects include those from the proposal, plus those arising from previous lease sales including potential tankering of Canadian crude through the area. The risk from the one oil spill of 1,000 barrels or greater estimated in the cumulative case would significantly, but temporarily, degrade water quality in the planning area. Overall, oil pollution would be increased from that for the proposal alone, but no other effects on water quality would be greater than for the proposal due to the timing of the particular sales, their production/construction schedules, and the duration of anticipated effects. Significant long-term effects on regional water quality would still be very unlikely. Low water-quality effects would occur through short- and long-term local degradation.

CONCLUSION: Low water-quality effects would occur through short- and long-term local degradation.

(b) Impact on Air Quality

In the North Aleutian Basin, effects on air quality from the proposal are expected to be low, based on projected emission of offshore exploration and production activities (one platform) and potential expansion of one onshore facility in an area of pristine air quality. Projected peak emissions from one platform would not exceed State or Federal air-quality limitations unless concentrated nearshore in small areas. In that event, existing control technology would ensure attainment of standards, although air quality would not be absolutely pristine near facilities. Onshore emissions also would be subject to Federal PSD review and modeling. Section IV.B.11.a.(3) discusses individual potential effects.

CONCLUSION: Impacts on air quality from activities of the proposal would be low.

CUMULATIVE IMPACTS: Cumulative effects of offshore emissions also are expected to be low. The cumulative amount of offshore emissions which could occur nearshore may be estimated by combining the projected emissions for the St. George Basin and North Aleutian Basin Planning Areas. In the cumulative case 2050 mmbbls of oil would be expected to be produced from 14 platforms in the St. George and North Aleutian Basin Planning Areas. The combined production-related emissions could exceed Department of the Interior air quality analysis exemption levels for all pollutants if all operations were located approximately 5 kilometers (3 miles) offshore near the St. George/North Aleutian boundary (165°W longitude).

Cumulative air quality effects would be seen in Balboa Bay as a result of the piping of natural gas from the St. George and North Aleutian Basins to an LNG facility at that Bay. This facility would have to meet all Federal and State air quality and Class II PSD standards. As a result, control technology would be required.

Again, because an oil-storage and marine-loading terminal would be required to meet State and Federal ambient air-quality and Class II PSD limitations, no unavoidable effects on air quality are foreseen.

CONCLUSION: Cumulative impacts of the proposal on air quality would be low.

(4) Biological Environment

(a) Impact on Plankton and Benthos

Various lifestages of organisms inhabit benthic, surficial, or nearshore waters are in or adjacent to the planning area. The planktonic larvae of crab species are concentrated in nearshore waters and/or upper levels of the water column (to 60 m) for several months. After metamorphosing to juveniles and settling to the bottom, they inhabit shallow, nearshore areas. Adult shrimp, which are generally pelagic organisms, use coastal shallows for spawning.

Due to the rapid dilution expected following discharges and the limited radius of effects, effects on planktonic organisms from discharges of drilling fluids (382,000 bbls.), cuttings (426,000 bbls.), and formation waters (up to 330 mbbl.) from one platform projected over the life of the proposal would be limited. This is documented in the FEIS for the North Aleutian Basin Sale 92. Discharges from 51 wells would occur in water depths from 30 to 100 meters and, therefore, would be expected to dissipate and dilute rapidly. Under these conditions, lethal effects from such discharges on plankton would be expected only within a few meters of the discharge point.

Oil spill effects on planktonic species also would be limited. Effects would be restricted to the area affected by the one estimated oil spill of 1,000 barrels or greater, which would be relatively small compared to the extensive alternate habitat inhabited by benthic and pelagic lifestages of most species. Furthermore, concentrations in the water column associated with the spill would approach lethal concentrations for plankton only a short distance from the spill site. Beyond this, concentrations would diminish with distance and over time (several days) to concentrations well below those shown to produce effects. Therefore, only a small portion of the regional populations of planktonic organisms in the Bering Sea could be affected.

An oil spill that impacted a nearshore area occupied by eggs, planktonic larvae, and juveniles of important fish species could have a more serious effect. These lifestages could experience mortality or sublethal effects that affect their ability to develop, reproduce, or survive natural environmental stresses. A localized change in the distribution and/or abundance of the affected portion of the regional population for one generation could result.

CONCLUSION: Overall, effects of the proposal on regional populations of planktonic invertebrates are expected to very low. Impacts on local populations could be low.

CUMULATIVE IMPACTS: Activities that may produce cumulative effects on invertebrates include other Federal and State ongoing and proposed petroleum development, commercial fishing operations, and non-petroleum activities (see IV.B.11.a.(2) and IV.B.15.a.(2)). In the cumulative case, planktonic invertebrate lifestages in the pelagic environment may inhabit areas with increased oil spill risk; however, effects on these regional populations are still expected to be low. Although these offshore, planktonic organisms include crab larvae and juvenile and adult shrimp, which may be killed by hydrocarbons concentrations below their 0.1-ppm LC50 value, they are widely distributed during their pelagic existence. Even a oil spill that spread over 200 square kilometers would kill or affect only a localized number of these organisms that constitute a portion of a regional population.

CONCLUSION: In the cumulative case, plankton are expected to experience a low effect.

(b) Impact on Fish Resources

Based on morphology and habitat, North Aleutian fisheries resources may be grouped into four major categories: (1) the salmonids; (2) forage fish, including herring, capelin, Pacific sand lance, boreal smelt, and eulachon; (3) demersal or benthic groundfish; and (4) red king crab.

Salmonids: The five species of Pacific salmon and the steelhead trout are the salmonids which may be affected by this proposal. Salmonids may be affected by seismic activity, drilling discharges from 12 exploration rigs and production 1 platform and the one estimated oil spill.

Seismic activity for the projected level of activity are expected to result in very low effects on salmon. This is primarily due to the limited radius of effects produced by the nonexplosive seismic devices (airguns and sparkers) expected to be employed. These devices have been demonstrated to be innocuous to fish beyond a short distance (0.6 to 1.5 m) of the detonation source. (kostyuchenko, 1973) Few, if any, salmon are expected to be within the limited range of effects for these seismic divices.

Effects on salmon for discharges of drilling fluids (382,000 bbl.), cuttings (426,000 bbl.), and formation waters (3.7 to 3.30 mbbl) from 51 wells projected over the life of the proposal also would be limited. This is because of the rapid dilution expected following discharges and the limited radius of effects. Discharges from the 51 wells would occur in water depths from 30 to about 100 meters, and therefore, would be expected to dissipate and dilute rapidly. Under these conditions, lethal effects from such discharges on pelagic salmon would be expected only within a few meters of the discharge point, and sublethal effects would be expected out to 100 meters.

Because of the relatively small area of contamination from the projected 51 wells and one platform compared to the extensive habitat available to adult and juvenile salmon in offshore areas of the planning area, low effects from these discharges would be expected.

Salmon that contact hydrocarbons as a result of an oil spill in the planning area may experience mortality or varying degrees of sublethal effects, depending on the lifestages contacted, the location and areal extent of the spill, and the degree to which the oil has weathered prior to contact. The sublethal effects of hydrocarbon exposure may affect the ability of a fish to survive or reproduce. Adult salmon, having a 96-hour LC50 of hydrocarbon exposure than are benthic fish. Newly emerged salmon fry are the most susceptible lifestage (Rice et al., 1979; Moles et al., 1979).

Pelagic adults in the upper water column contacted by an oil slick or the water soluble fraction around and below the single estimated spill of 1,000 barrels or greater, may experience mortality or sublethal effects. Mortalities are expected to be limited because concentrations in open-water areas are low. Adult salmon have demonstrated LC50 values of 1 to 3 ppm in laboratory studies. Hydrocarbon concentrations of 0.21 ppm at 20 meters deep (Vandermeulen, 1982) and 0.1 ppm at 100 meters deep (Marchand, 1978) have been observed following oil spills, which could result in mortalities and sublethal effects.

Effects on pelagic salmon would be restricted to the area affected by the spill, which would be relatively small compared to the extensive alternative habitat available to adult and immature salmon in the pelagic environment. Furthermore, concentrations in the water column associated with the spill would approach lethal concentrations for adult and juvenile salmon only a short distance from the spill site. Beyond this, concentrations would diminish with distance and over time (several days) to concentrations well below those shown to produce lethal effects on adults and juveniles. Therefore, only a small portion of the widely dispersed regional population of salmon in the pelagic environment potentially could be affected.

Effects on salmon from an oil spill that occurred when vulnerable lifestages were present could be moderate. If an oil spill impacted an area where juvenile salmon were congregated, all or most of the salmon contacted could be killed or could be subjected to sublethal effects that might affect their ability to develop, reproduce, or survive natural environmental stresses. Adult salmon could be prevented from entering their natal stream and reproducing, which could result in very serious, but localized (i.e., Port Moller) effects. A localized change in the distribution and abundance of the affected portion of the regional population over more than one generation would result in a moderate effect.

CONCLUSION: Effects of activities associated with the proposal on regional populations of salmon are expected to be low. Local impacts could be moderate.

CUMULATIVE IMPACTS: Activities that are analyzed for their potential to produce cumulative effects on salmon include the proposed Apollo and Sitka mines on Unga Island, State of Alaska onshore leasing, other Federal offshore oil and gas leasing, tankering of Canadian oil through the Bering Sea, and commercial fishing.

Proposed tankering of Canadian oil through the Bering Sea would pose little or no additional risk to the salmon resources of the planning area because the proposed route to Asian markets is distant (approximately 400 miles) from the planning area and to migration corridors used by the regional salmon stocks. An oil spill occurring along this route would pose no risk to these salmon.

Commercial fishing continues to be a primary contributor of cumulative effects on regional salmon stocks. For analysis purposes in this EIS, it is assumed that these stocks remain in equilibrium, even with commercial-fishing-harvest mortalities. However, regulation of salmon harvest and escapement is not a perfect science and is fraught with many uncertainties; therefore, significant population effects could result from certain fishery management decisions. For instance, overescapement into spawning areas could result in overpopulation of available spawning and rearing habitat. This could result in rapid transmittal of diseases in local salmon stocks, with resulting mortalities.

Overharvest could result in too few spawners being allowed to escape with resultant declines in productivity. In these two examples it is possible that significant effects on regional salmon stock could accrue from regulation of commercial fishing.

CONCLUSION: In the cumulative case, the effects on regional populations of salmon are expected to be low. Local impacts could be moderate.

Forage Fish: Effects of seismic activities and discharges of drilling fluids (382,000 bbls.), cuttings (426,000 bbls.), and formation waters (up to 330 mbbls.) on forage fish are similar to those described for salmon in the preceding section, very low.

Offshore oil-spill effects from the one assumed oil spill of 1,000 barrels of greater on forage fish also would be limited. Pelagic effects on forage fish would be restricted to the area affected by the spill, which would be relatively small compared to the extensive alternate habitat available to forage fish in the pelagic environment.

However, effects on forage fish from an oil spill that impacted nearshore area when vulnerable lifestages were present could be more serious. The regional populations of capelin, Pacific sand lance, boreal smelt, and eulachon could experience moderate effects from a oil spill that contacted a nearshore area being used by various reproductive lifestages of these, species, and resulted in mortalities and sublethal effects that may affect their ability to develop, reproduce, or survive natural environmental stresses. A localized change in the distribution and abundance of the affected portion of the regional population over more than one generation could occur, resulting in a moderate effect.

An oil spill that impacted a nearshore area being used by the reproductive stages of herring could result in a high effect on that particular regional population. Spawning adults, roe, larvae, and juveniles could be killed or could experience sublethal effects following an oil spill that impacted a nearshore area (particularly Port Moller or Port Heiden). Oilspill mortalities of roe and larvae would further reduce these year-classes, which experience high natural mortalities. Because herring are repeat spawners, a number of adult year-classes could be reduced. Contact of hydrocarbons and herring spawning substrates (Fucus or Zostera) could result in (1) mortality of these species and a resultant reduction in suitable spawning habitat or (2) increased or prolonged exposure of herring reproductive lifestages to hydrocarbons, both of which could result in reduced reproductive success over a number of years. The aggregate effect of mortalities of various lifestages of herring and their spawning substrates could result in a decrease in the distribution and/or abundance of the regional herring population, beyond which it would not be expected to return to its former level within several generations, which would be a high effect.

CONCLUSION: Overall, effects of activities associated with the proposal on regional populations of herring and other forage fish are expected to be Low. Local impacts could be high.

CUMULATIVE IMPACTS: Activities that are important for their potential to produce cumulative effects on forage fish species include other Federal offshore oil and gas leasing, tankering of Canadian oil through the Bering Sea, and commercial fishing. Oil spills resulting from these activities are the factors of greatest concern.

Commercial fishing would continue to be a primary contribution of cumulative effects on regional stocks. Herring fisheries are extremely difficult to regulate due to the intensive nature of the harvest activity, which occurs during a very short period. Overharvest of adult herring may result in a decline in overall strength of a given year-class, resulting in subsequent declines in a portion of the regional population that may not recover for several generations.

CONCLUSION: In the cumulative case, effects on forage fish could be moderate. Impacts on a local population could be high.

Groundfish: Seismic activities from the projected level of activity (1 platform, 12 exploration wells and 39 production wells) are expected to result in very low effects on groundfish. This is primarily because of the limited radius of effects produced by the nonexplosive seismic devices (airguns and sparkers) expected to be employed. These devices have been demonstrated to be innocuous to fish beyond a short distance (0.6 to 1.5 m) of the detonation source. Few, if any, groundfish are expected to be within the limited range of effects for these seismic devices.

Effects on groundfish from discharges of fluids (382,000 bbl.), cuttings (426,000 bbl.) and formation waters (3.7 to 330 mbbl.) from the 51 wells projected over the life of the proposal also would be limited. This is because of the rapid dilution expected following discharges and the limited radius of effects. Discharges from all 51 wells would occur in water depths from 30 to 100 meters, and therefore would be expected to dissipate and dilute rapidly.

Most oil spill effects on groundfish from the estimate one oil spill of 1,000 barrels or greater would be limited. Effects on various lifestages of groundfish would be restricted to the area affected by the spill, which would be relatively small compared to the extensive alternate habitat inhabited by groundfish in the eastern Bering Sea. Furthermore, concentrations in the water column associated with the spill would approach lethal concentrations only a short distance from the spill site (100 meters). Beyond this, concentrations would diminish with distance and over time (several days) to concentrations well below those shown to produce effects on groundfish. Therefore, only a small portion of the regional population potentially could be affected.

Pollock, yellowfin sole, and halibut stocks in the planning area have experienced declines and could be affected more seriously by oil-spill effects from the one estimated oil spill of 1,000 barrels or greater than other species whose stocks remain abundant. The more susceptible, early lifestages of these species that inhabit surficial waters (i.e., pollock eggs, larvae, and juveniles) or shallow, nearshore inner-shelf waters (i.e., yellowfin larvae and juveniles; halibut later larval stages and juveniles; pollock juveniles) are particularly vulnerable to oil-spill effects.

Effects on these species from an oil spill that occurred when vulnerable lifestages were present could be moderate. More susceptible, early lifestages of groundfish (eggs and larvae) and juveniles, which inhabit shallow, nearshore waters, would be particularly vulnerable to an oil spill that contacted a nearshore area. Mortalities and sublethal effects resulting from such a spill could reduce portions of several year-classes.

However, the effect of an oil spill would be localized compared to the widespread distribution of these lifestages in the eastern Bering Sea, and is expected to affect only a portion of the regional population of a groundfish species, thus resulting in a moderate effect.

CONCLUSION: Overall, effects of this proposal on regional populations of groundfish are expected to be low. Impacts on local populations could be moderate.

CUMULATIVE IMPACTS: Activities which may produce cumulative effects on groundfish include other Federal and State ongoing and proposed petroleum development, commercial fishing operations, and other non petroleum industry activities.

In the cumulative case, vulnerable lifestages of groundfish would continue to be effected by the one oil spill of 1,000 barrels or greater estimated as a result of the proposal. Consequently, effects are the same as for the proposal in these nearshore areas, which are used by egg, larval, and juvenile lifestages of numerous groundfish species.

CONCLUSION: In the cumulative case, regional populations groundfish are expected to experience low effects. Moderate impacts could occur to local populations.

Red King Crab: Seismic activities from the projected level of activity (1 platforms, 12 exploration wells and 39 production wells) are expected to result in very low effects on red king crab. This is primarily due to the limited radius of effects produced by the nonexplosive seismic devices (airguns and sparkers) expected to be employed. These devices have been demonstrated to be innocuous to fish beyond a short distance (0.6 to 1.5 m) of the detonation source. Few, if any red king crab are expected to be within the limited range of effects for these seismic devices.

Effects on red king crab from discharges of drilling fluids (382,000 bbl.), cuttings (426,000 bbl.), and formation waters (3.7 to 330 mbbl.) from the 51 wells projected over the life of the proposal also would be limited. This is due to the rapid dilution expected following discharges and the limited radius of effects.

Oil spills (one is estimated) that occur offshore could potentially affect adult crabs, should oil be transported to the benthos. The water depth in the planning area (greater than 50 m) would inhibit sublethal ranges to red king crab from reaching the benthic environment. Therefore, considering the relatively small area that could be contacted by a spill, only a very small segment of the total adult population could be affected.

An oil spill that impacted a nearshore area being used by red king crab could be serious. Port Moller, the area that contains the most vulnerable concentrations of red king crab lifestages, is the area most at risk to oil-spill effects. Mortalities and sublethal effects could result in reductions in numbers of several year-classes, including eggs, larval zoeae, and juveniles and adults of age-class 3+.

CONCLUSION: Overall effects of this proposal on regional populations of red king crab could be high.

CUMULATIVE IMPACT: Activities that are analyzed for their potential to produce cumulative effects on red king crab include other federal offshore oil and gas leasing, tankering of Canadian oil through the Bering Sea, and commercial fishing operations.

These reductions, combined with the extent of the depressed population level of red king crab in the southeastern Bering Sea, could result in a further decline in the population from which it would not be expected to recover within several generations, thus resulting in a high effect on the regional population of red king crab.

Fishing poses a significant potential threat to red king crab. The harvest of red king crab in the planning area plummeted from a high of about 130 million pounds in 1980-81 to 3 million pounds in 1982-83. This fishery was closed during the 1984-85 season. Overharvest of the resource is considered one of the major contributing factors in the recent depression of the red king crab stocks in the Bering Sea.

CONCLUSION: In the cumulative case, the impacts on red king crab would be high.

(c) Impact on Marine Mammals

Thirteen species of nonendangered marine mammals--sea otter, northern fur seal, Pacific walrus and Steller sea lion; Pacific harbor, spotted, ribbon, and bearded seals; minke, killer, and beluga whales; and harbor and Dall's porpoises--commonly occur in a portion of or throughout the North Aleutian Basin planning area and are very likely to have some interaction with OCS activities. Oil pollution and disturbance due to increased human activity and habitat alterations could adversely affect marine mammal populations found in the planning area. The general effects of oil spills, noise and disturbance, and habitat alterations on marine mammals are discussed in Section IV B.11.a.(4) Impacts on Marine Mammals in the Gulf of Alaska Planning Area.

Major concentrations of the estimated 27,000 sea otters present along the northern coast of the Alaska Peninsula from Unimak Island east to Port Moller are the population of marine mammals at greatest risk from oil spills that may be associated with the proposal. If an oil spill contacted a high density sea otter habitat 400 to 700 sea otters could be killed. This would represent a moderate impact on the sea otter population.

Large numbers of sea lions, harbor seals, or walruses could become contaminated if a spill contacted the Amak Island, Izembek, Port Moller, or otter important rookeries or haulout areas in the planning area. However, harbor seals, sea lions and walruses would not suffer high mortalities from oil spill contact with only weak individuals and perhaps young pups suffering serious effects. An oil spill is likely to cause low effects on harbor seal, walrus, sea lion populations. Fur seals, spotted, bearded, and ribbon seals are likely to suffer no more than low effects from an oil spill an from even a large spill in North Aleutian Basin planning area because these seals are widely distributed along their migration routes, pelagic feeding habitats, or winter ice habitats with animals swimming and feeding in small groups and not in large herds. Also, fur seal migration through the planning area also occurs over several weeks; thus, large numbers of fur seals and ice seals are not likely to come in contact with even a large oil spill which would become highly weathered and dispersed within ten days of the spill release. Although cetaceans could be exposed to an oil spill or gas condensates on the water surface or in the water column, only highly stressed individuals could possibility suffer serious sublethal effects (see discussion of generic effects under Sec IV B.11.a(4) from the probable, very brief exposure to concentrated hydrocarbons; thus oil spill effects on cetaceans in the North Aleutian Basin planning area are likely to be very low.

Harbor seals inhabiting major breeding and haulout habitats in Izembek, Port Moller, Port Heiden, Ugashik Bay or Egegik Bay areas could be exposed to some noise and disturbance from the helicopter and support-vessel traffic centered out of onshore support or development facilities at Cold Bay, Unalaska, or Port Heiden. Sea lions breeding on Amak Island may be disturbed by some aircraft overflights. Aircraft traffic associated with the proposal may also disturb hauled out walruses at Cape Seniavin and to otter haulout sites. However, noise and disturbance from aircraft and vessel traffic would be very transitory and brief in duration. The frequency of disturbance is likely to be low and of little apparent consequence, unless pupping activities are disrupted. Disturbance of harbor seal and sea lion rookeries during the pupping season could significantly reduce pup survival. However, the Marine Mammal Protection Act and existing regulations could help to prevent excessive disturbance of harbor seals and other marine mammals. Thus, overall levels of disturbance effects are likely to be low.

Noise and disturbance from air and boat traffic and seismic-geophysical exploration activities associated with offshore oil and gas activities in the North Aleutian Basin area could cause brief startle, annoyance, and/or flight responses of whales, dolphins, and porpoises, however, the continued presence of dolphins, porpoises, and whales in coastal marine habitats with high levels of industrial activity and frequent marine traffic (such as Bristol Bay) strongly suggests that nonendangered cetaceans are able to adjust to man-made noise and disturbance. Present knowledge on cetacean behavior in association with industrial noise sources suggests that effects of disturbance on nonendangered cetaceans are likely to be very low. Construction activities associated with the proposal (installation of an oil and gas platform and an offshore pipeline) are likely to have short-term or very low effects on marine mammals with any avoidance of the drill platform site or pipeline route by whales or otter marine mammals subsiding after construction activities are complete.

CONCLUSION: In the North Aleutian Basin planning area, there could be moderate effects on sea otters, low effects on pinniped species, and very low effects on nonendangered cetaceans.

CUMULATIVE IMPACTS: The additive effects of other ongoing and planned projects, as well as the proposal on nonendangered marine mammals are discussed in this section (also see IV.B.11.a.(2) and IV.B.15.a.(2)). Although the probability of any or all planned and ongoing projects reaching developmental stages is generally unknown, this analysis assumes that all projects do reach developmental stages. These projects could affect marine mammals by oil spills, noise and disturbance, and by habitat alteration.

Projects that could have cumulative effects on marine mammals in the planning area include possible oil tankering through Unimak Pass associated with OCS leases in the Bering Sea, increases in other commercial and fishing vessel traffic through Unimak Pass, possible oil tankering from Balboa Bay and other development facilities there that could be associated with North Aleutian Basin and Shumagin planning areas, and commercial fishing activities in the Bering and North Pacific. Cumulative vessel traffic through Unimak Pass will increase the chance of vessel collisions and tanker spills or other hydrocarbon (fuel oil-bunker C oil) spills in the Unimak Pass and the North Aleutain Basin area. Oil spills in the Unimak Pass area would pose a threat to local sea otter populations and the 871,000 northern fur seals migrate through the pass during the spring and fall.

Noise and disturbance associated with increases in marine traffic and increases in air craft associated with cumulative oil development and increases in the human population in North Aleutian-Unimak Pass area could result in the temporary and perhaps long-term displacement of marine mammals, particularly seals and sea lions from haulout sites and rookeries that are adjacent to air and/or vessel traffic routes. If the air and/or vessel traffic is frequent enough to cause long-term or permanent displacement of a portion of a species regional population to a less favorable habitat (haul-out-rookery site) impacts could be moderate to very high if a species population was reduced and the recovery of the population to its former level took 10 years or more (very high impacts). However, pinnipeds, and other marine mammals populations may habitate to cumulative sources of noise and disturbance after perhaps a few years such that these effects are likely to be moderate. Marine mammals could also be incrementally affected by changes in abundance and distribution of prey species due to commercial fishing in the Bering Sea and North Pacific particularly if bottom fisheries are established in Alaska.

Pinnipeds and other species populations may suffer cumulative population declines associated with the loss of animals entrapped in discarded fishing gear or losses from active gill net fisheries.

CONCLUSION: Impacts would be moderate on nonendangered cetaceans, fur seals, and sea otters and low on other species.

(d) Impact on Coastal and Marine Birds

The effects of an oil spill on birds would vary with season, duration of exposure, and volume and composition of oil. A winter spill in the southeastern Bering Sea could affect overwintering cormorants, sea ducks, gulls, and alcids. In addition, fulmars, shearwaters, storm petrels, dabbling ducks, shorebirds, and alcids could be affected by summer spills. Loons, ducks, geese, shorebirds, and alcids would be the groups most adversely affected by spills during their spring and fall migrations. In August and September, large numbers of flightless adult and young murres and other alcids are concentrated on the water surrounding colonies prior to post-breeding dispersal. Embayments containing marshes or major river deltas, and nearshore areas where prey organisms are concentrated, are the most vulnerable habitats.

Seabirds are expected to be subject to high effects from an oil-spill only in the vicinity of large colonies in the Shumagin Islands where tankers would pass in transit. Only one oil spill of 1,000 barrels or greater is estimated. During the nesting season, when large numbers of foraging birds are on the water, mortality resulting from a spill may exceed 15-20 percent of a large colony. Recovery from such an event could require 10 to 20 years.

Elsewhere south of the Alaska Peninsula, and north of the peninsula in that portion of the inshore zone including the 50-meter depth contour, oil-spill effects are not likely to exceed moderate. On the northern side of the peninsula moderate effects would most likely occur in summer or fall when an oil-spill would have the highest probability of entering the inshore zone and bird densities are relatively high. The Aleutian tern population breeding in Port Moller, representing 10 to 30 percent of the world population, could experience high effects if contacted by an oil spill in this area.

Certain water fowl and shorebird populations occupying lagoons and bays along the northern side of the Alaska Peninsula during spring and fall migration are vulnerable to high effects at these times. Brant, crackling Canada, white-fronted, and emperor goose populations are particularly vulnerable because most of their Pacific or world population concentrates in Nelson and Izembek Lagoons. The world population of Steller's eider is also concentrated here during migration. Effects on populations of most duck species using the lagoons are low as a result of their more dispersed distributions and/or greater population size. Because of their concentration in Izembek Lagoon, Steller's eiders could experience moderate effects.

Air traffic between Cold Bay and an offshore platform could be a significant source of adverse effects. Brant are the most sensitive species, especially to helicopters, and overflights of Izembek Lagoon in spring and fall may flush geese from the water. Repeated disturbance could displace brant, and other waterfowl species, from favored foraging areas to portions of the lagoon where food is less plentiful or of lower quality, and competition may be greater. This may result in decreased energy intake during these critical periods of premigratory fattening, and overall poorer condition prior to extended migratory flights. Any elevated mortality resulting from forced overwintering in Alaska could contribute to the decline of the brant population.

CONCLUSION: Throughout most of the planning area, particularly in coastal areas north of the Alaska Peninsula, in the Shumagin Islands and where large shearwater flocks occur, adverse effects on regional populations are expected to be moderate. Impacts on local populations may be high.

CUMULATIVE IMPACTS: The potential for cumulative effects is most notable in Unimak Pass, and nearby shelf-break areas. If a spill occurred in the Unimak Pass area in late spring, summer, or fall, marine bird populations, including those nesting in the adjacent eastern Aleutians, could experience moderate to high effects.

Most waterfowl and shorebirds are highly migratory and thus are likely to migrate through, overwinter in, or nest near other State or Federal lease sale areas where they could experience adverse effects that might intensify any problems resulting from petroleum development in the North Aleutian Basin. Additionally, several Alaskan goose populations (especially cackling Canada, brant, emperor, and white-fronted) have undergone substantial population reductions as a result of continued intensive hunting pressure in both nesting and wintering areas and a reduction in winter habitat.

During spring and especially fall migration periods, hunting pressure may make these populations more vulnerable to oil in the environment.

Other factors that may make a substantial contribution to cumulative effects include mortality resulting from seabirds accidentally captured in salmon driftnets and reduction in prey availability. The cause of apparent prey-species decline may be linked to climatic factors, increased commercial fishing effort in Alaskan waters, and/or other factors (Springer et al., 1983, 1984, 1985). A combination of such factors could result in significant declines in regional seabird populations.

CONCLUSION: Cumulative effects on regional marine bird populations would moderate within the North Aleutian Basin. Local populations may experience high impacts.

(e) Impacts on Endangered and Threatened Species

All eight endangered whales have been recorded in or adjacent to the North Aleutian Planning Area. The Aleutian Canada goose and the short-tailed albatross may occur in the planning area although none have been sighted there. The peregrine falcon nests along the Kuskokwim River and may stray into the area. The historic range of the Eskimo curlew included the Pribilof Islands so passage through the area probably occurred (none have been sighted in Alaska for many years). There are no listed plant species in areas adjacent to the planning area. Refer to Section IV.B.11.a.(4) in this document and Sale 92 FEIS for specific details on effects to endangered species that may occur as a result of oil and gas activities associated with the proposal.

A formal Section 7 Endangered Species Consultation of MMS with NMFS and the FWS was conducted for proposed Sale 92 for the North Aleutian Basin. The biological opinion from the FWS was dated 11/4/83 and covered American and Arctic penegrine falcons, short-tailed albatross, Eskimo curlew and Aleutian Canada goose. The biological opinion from NMFS is dated 3/21/84 and covered potential effects of exploration activities on endangered whales. See Chapter V for a further description of the consultation process for Section 7 of the Endangered Species Act of 1973.

Noise disturbance associated with the proposal includes geophysical seismic surveys, vessel and air support traffic. Air and vessel support will bisect the planning area during trips to and from Unalaska (marine) and Cold Bay (air) and the single drilling platform. Noise disturbances along whale migration routes (including those located outside the planning area) could result in alterations of historic routes, displacement from summer feeding areas and possible timing delays in migration completion. Increasing the time spent migrating leaves less time for summer feeding and may preclude reaching all desired summer feeding areas.

Bowhead whales visit the planning area only during heavy ice years. Blue and sei whales seldom migrate north of the Aleutian Chain, although sei whales have been observed in the planning area. Sperm whales prefer habitats of deep water, such as areas seaward of the continental shelf. These four species of whales are not expected to experience any significant adverse effects from the proposal. Gray whales migrate close to shore and generally will be found within three miles (5km) of shore during the spring migration. They would be most affected by continuous support traffic and the construction of the pipeline. Continuous noise disturbances during the summer feeding period could displace the whales from their estuarine feeding habitats. Humpbacks also frequent the nearshore waters. They could be exposed to the same activities, however, they feed on schooling fish and pelagic crustaceans as opposed to the gray whales which feed on benthic crustaceans. Fin whales are more pelagic and therefore likely to be in the area of actual exploration and development.

CONCLUSION: Effects to the blue, sei, sperm, and bowhead whales and the endangered birds would be very low. Effects from the proposal to gray, fin, right, and humpback whales would be low.

CUMULATIVE IMPACTS: Development in this planning area could add long term effects especially to gray whales which migrate through the planning area. The nearshore area appears to be one of the first significant spring feeding areas and displacement from these areas by oil and gas activities could result in long term changes of migration routes and timing of the migration. Those whales that prefer more pelagic areas are less likely to be affected by the placement of one production platform.

CONCLUSION: Effects to endangered whales (except grays) are expected to be low. Effects to gray whales could be moderate.

(f) Impact on Estuaries and Wetlands

These topics are discussed and impacts analysed where they occur as habitat for the fish and wildlife species in (4)(a) through (4)(f) in this section.

(g) Impact on Areas of Special Concern

These areas are all habitat for the fish and wildlife species in (4)(a) through (4)(f) and impacts are discussed as they occur in the planning areas.

(h) Impact on Marine Sanctuaries

There are no marine sanctuaries in the Alaska OCS Region.

(5) Socioeconomic Environment

(a) Impact on employment and demographic conditions

The search for and discovery of oil and gas within the North Aleutian Basin planning area could create employment opportunities and consequently increased population levels. These changes have both positive and negative attributes, thereby giving an indication of the socioeconomic well being of communities or regions within the State.

This proposal could generate a region wide total of about 440 jobs during peak activity. This is based on estimates made in past EIS's for the Alaska OCS Region for similar activities in similar areas. The bulk of the jobs (perhaps 90%) will be filled by workers living in enclaves near the job site.

The general pattern is one of small employment effects in the exploration phase and fairly large effects during the development phase (starting in 1991) with most jobs in both the exploration and development phases filled by commuters living in the petroleum industry enclave. By contrast, it is expected that the moderate number of new jobs created during the production phase (starting in 2001) would be filled somewhat by permanent residents of a community.

A State wide peak population increase of about 170 persons could be associated with the projected employment increase. Of that number a small proportion may live in a small town associated with development activity. The bulk of the new population (families of enclave living workers) would live in Anchorage. The Matanuska Valley or on the Kenai Peninsula. Impacts are potentially more significant in those areas of small present populations near which offshore-related activities may be located.

For the planning area, Cold Bay and Unalaska are the towns that may be affected. Because of the small number of new jobs and population anticipated, impacts are expected to be low on a regional basis. Impacts at any one of the named villages could be moderate during an influx of population depending on timing and duration.

Siting an oil and gas terminal in Balboa Bay could intensify changed already occurring in Sand Point as a result of population growth due to groundfish industry development. The social organization of Sand Point could be altered somewhat due to population growth, creating a more diversified sand stratified community as well as creating a decrease in the ability to depend on the kinship structure for a support network. The current trend toward displacement of Aleut cultural values and orientations is expected to continue as the population grows and more employment opportunities become available. This trend could be intensified somewhat with the proposal, although the effects would be minor in view of the changes already occurring in the development of the groundfish industry at Sand Point.

Expected economic effects include increases in the job totals for Unalaska and Cold Bay, but no decline in joblessness in those communities. Possible negative economic effects could occur at Unalaska in the form of port congestion, housing shortages, and increased rates of price inflation--including rental housing prices.

CONCLUSION: Effects on employment and demographic conditions on the region and in Cold Bay and Unalaska would be very low. Effects on Sand Point would be low.

CUMULATIVE IMPACTS: Cumulative effects of Federal oil and gas development in the North Aleutian Basin Region plus the State generated activities could substantially increase regional employment and populations. Because of the size the planning area and the wide distances between coastal villages, local employment and population growth will more nearly follow estimated employment and population growth figures for the planning area rather than experience much growth for a cumulative basis.

CONCLUSION: Cumulative employment and subsequent population growth will be moderate both regionally and at the local level.

(b) Impact on Coastal Land Uses

Land-use conflicts between OCS activities and existing land uses and plans in the North Aleutian Basin area, other than at sites proposed for exploration and development infrastructure, would generally not occur. Unalaska and Cold Bay are potential support-base sites, while a pipeline would be developed across the Alaska Peninsula following the proposed Port Moller/Balboa Bay transportation corridor. A marine terminal also would be constructed in the Balboa Bay area.

Land use requirements at Cold Bay are expected to be minimal. A small support base would be constructed near the airport, which would contain a hangar/warehouse complex, dormitories for transient personnel, offices and helipad. Such a facility would require 2-3 hectares, with an additional 2 hectares needed for residential purposes. These land requirements are not expected to pose a problem. Currently, negotiations between the city, State and Federal governments are expected to add at least 405 hectares to the city.

The development scenario for the North Aleutian Basin uses Unalaska as a marine-service base because of its strategic location near Unimak Pass, its good natural anchorage, and its existing marine infrastructure. The existing marine-support facility at Captain's Bay should be adequate to support exploratory drilling activities. This facility, designed to oil industry specifications, was established in 1982 to support Bering Sea (Continental Offshore Statigraphic Test) COST wells. Development and production activities could require facility expansion to provide additional dockside space, warehousing, and open-air storage. Actual use would depend on the amount of production activity. Because of the limited number of production platforms projected (one) to be used, the existing facility should be adequate. Thus, facility-related land-use effects are expected to be low.

In regard to the Port Moller/Balboa Bay transportation corridor, pipeline development may have a high impact on wilderness values along the proposed route. Construction and maintenance vehicles would impair the area's naturalness through alteration of soils and vegetation. The development of a pipeline and service road following the above route would pass through the Alaska Peninsula National Wildlife Refuge and conform with the preferred alternative identified in the Draft Refuge Comprehensive Conservation Plan (USDOI, USFWS, 1984). Pipeline development would be subject to the provisions of Title XI of ANILCA and USFWS requirements concerning rights-of-way. The marine terminal, LNG plant, and most of the pipeline corridor would be outside the refuge on land selected or conveyed to the native corporations. As a result, the decision to build these facilities would be largely up to the Native landowners (USDOI, USFWS, 1984).

CONCLUSION: The effects would be moderate.

CUMULATIVE IMPACTS: Additional facilities would be required in Unalaska and Cold Bay to support exploration and development in the Navarin, St. George, and North Aleutian Basins. This is particularly true for Unalaska, which, in addition to providing OCS facilities, is expected to emerge as a major port for the burgeoning groundfish industry. The additional facility requirements would increase competition for limited docking facilities.

If existing port facilities are not suitable or are unavailable, industry may choose to construct additional piers and warehouse complexes in the Unalaska area. In the cumulative case, the effects on land use along the route selected for pipeline development would be the same as those identified for the proposal, since OCS activities in the North Aleutian Basin would provide the only impetus for change in this area.

CONCLUSION: The cumulative effect of development activities on land uses would be high.

(c) Impacts on commercial fisheries

Potential adverse effects on the commercial fishing industry of the North Aleutian Basin include elimination or foreclosure of fishing areas by the presences of offshore facilities, with subsequent loss of harvest; gear conflicts resulting in loss or damage to fishing gear, harvest loss, and business downtime; oil spills resulting in gear fouling, closure of fishing areas, and direct loss or contamination of harvest; loss or damage to fishing vessels through collisions with oil industry vessels; and competition for support services, infrastructure, and labor.

Loss of harvest through foreclosure of fishing areas by offshore facilities (one platform and a pipeline) would be very low because the maximum projected space-catch loss is a small fraction of one percent for any of the fisheries in the North Aleutian Basin. Crab pot loss through seismic surveys in southeastern Tanner crab and Bristol Bay king crab fisheries would be very low. Crab-pot loss due to supply boat and barge traffic is expected to be very low. Damage to drift net and purse seine gear due to vessel traffic is expected to be very low, because the fishery is well away from vessel traffic routes. Longline gear loss is expected to be very low. Trawl gear damage due to oil development also is expected to be negligible, amounting to less than one incident per year.

A single oil spill of 1,000 barrels or greater is assumed. If it impacted fishing areas while the season was in progress, it could foul gill nets, purse seines, crab pot buoys and/or groundfish trawls, and could cause temporary foreclosure of fishing grounds. In the case of the salmon and herring fisheries, there is less chance of a spill occurring during the fishing seasons simply because the seasons are so short. However, because of the gauntlet nature of these fisheries, if a spill did occur during this short season, economic consequences to fishermen would be more severe than for any other fishery due to the inability to switch to an alternate fishing time or area. In the event that an oil spill occurred in the Port Moller area during the herring and/or salmon seasons, effects on these fisheries could be high.

Chances of oil spills contacting crab and groundfish fisheries are high due to the larger areas fished, the longer seasons for tanner and brown king crab fisheries, and the year-round operations of the groundfish fisheries. There may be economic alternatives for these fishermen; they may be able to switch to alternative fishing times and areas in the event of a spill. If spills occurred in the most highly productive areas, competition in alternatives fishing areas could increases. However, it is estimated that only 1 spill of 1,000 barrels or greater would occur over the life of the proposal. Effects on the red king crab fisheries are expected to be high because of the restricted fishing area and the effect on the red king crab population (Sec.IV.B.11.a.(4) Impacts of oil spills on groundfish fisheries would be low due to the large areas encompassed by these fisheries.

Competition for marine-support services and infrastructure would be very low, with some positive effects from oil-related increases in local employment and in the local availability of repair services. Collision risks through increased vessel traffic would increase slightly.

Competition for labor between the two industries would not be significant (Centaur Associates, 1983).

CONCLUSION: Overall adverse effects of this proposal on the commercial salmon, herring, and groundfish fisheries are expected to be low. High effects are anticipated for the red king crab fishery.

CUMULATIVE IMPACTS: Activities resulting in cumulative effects on the commercial fishing industry of this region include existing and proposed federal OCS lease sales in the Bering Sea--Sales 70, 89, and 101 in the St. George Basin; Sales 83 and 107 in the Navarin Basin; and Sale 92 in the North Aleutian Basin. All of these lease sales would result in increased oil industry vessel traffic in and out of Unalaska, an increased number of platforms and pipelines in the southeastern Bering Sea, and the potential for additional oil spills from tankering oil production from the above areas through Unimak Pass.

The potential adverse effects on commercial fisheries of the southeastern Bering Sea would include the elimination or foreclosure of fishing areas by the presence of offshore facilities, with subsequent loss of harvest; gear conflicts from supply-boat or seismic-boat traffic, resulting in loss of fixed gear (crab pots or longlines), loss of harvest, and downtime; gear fouling, closure of portions of fishing areas, and direct loss or contamination of harvest resulting from oil spills; loss or damage to fishing vessels through collisions; and competition for support services, infrastructure, and labor.

Gear conflicts could increase from those of the proposal, especially in the areas north of Unimak Pass. Unalaska would be the marine-support base for lease sales in the St. George, North Aleutian, and Navarin Basins, and supply boats and seismic vessels would be travelling back and forth between Unalaska and these areas. In addition, oil industry vessel traffic would be travelling through Unimak Pass to these areas and to the Beaufort Sea, Chukchi Sea, and Norton Sound areas. If several of the areas were developed at once, gear conflicts in the area north of Unimak Pass would be low in the cumulative case.

Centaur and Associates (1983) recently analyzed the magnitude of the effects from these cumulative Bering Sea lease sales on the commercial fishing industry of this region, in line with their projected increase in domestic fishing activity. The scenario assumptions used in their analysis deviate somewhat from those of this EIS; however, the conclusions are considered to approximate what could occur. In summary, their projected harvest loss resulting from preemption of the fishing area by oil industry facilities was less than $24,000 (1982 dollars) in the year 2007 (peak year). Pot loss for all Bering Sea areas was calculated not to exceed 1,205 pots lost during 1997, the peak year of oil industry vessel traffic according to the existing schedule. Longline-gear-loss incidents in 1997 are projected not to exceed two in the halibut fishery and 559 in the Pacific cod fishery. Trawl gear damage incidents are estimated to number 25 in 2007 (peak year), averaging $45,000/year in gear damage and

$25,000/year in lost fishing time. Collisions with fishing vessels would be at the rate of one every 79 years as of 1997, instead of the projected rate of one every 69 years without oil industry development.

The port of Unalaska would likely be the major marine-support staging area for almost all Bering Sea oil development activities. Harbor congestion from the cumulative sales probably would be minimal, considering current plans for dedicated oil industry dock space in Captain's Bay, which is located south of the major concentration of fishing-industry activity. Competition for labor also would be minimal, with the possibility of a positive benefit from additional employment opportunities during periods of poor earnings in the fisheries. Further, the increase in local availability of repair services also could benefit the fishing industry.

The severity of effects of oil spills on commercial fisheries would depend on what area the spills occurred. Some relatively small areas of the Bering Sea are very productive fisheries, where activity and gear are concentrated and where catch and income loss due to gear fouling or closures could be high if a spill occurred during the fishery. On the other hand, other areas contain very low concentrations of fish, so commercial fisheries would be only negligibly affected by a spill. Generally speaking, inner Bristol Bay, the Port Moller area, the Aleutians area near Unimak Pass, the area north of Unimak Pass as far as 57°N latitude, and the Pribilof Islands area are locations where an oil spill could do damage to commercial fishing operations if the spill occurred around the time that the season was in progress.

A spill impacting a major salmon- or herring- harvest area immediately prior to or during the harvest could result in closure of the grounds and a subsequent loss to the industry of thousands to millions of dollars. An occurrence such as this in inner Bristol Bay or near Port Moller on the Alaska Peninsula would be considered a high effect on the fishing industry. Oil spills from other areas in the Bering Sea appear to pose no risk to inner Bristol Bay areas.

The effect of the single estimated oil spill of 1,000 barrels of greater on red king crab could have high consequences. Such effects could lead to the eventual closure of the fishery to allow stocks to rebuild for 1 or more years. The subsequent loss to the commercial fishing industry could total millions of dollars.

CONCLUSION: Overall cumulative effects on the southeastern Bering Sea fisheries are likely to be low for the commercial salmon, herring and ground-fish fisheries. A high effect is anticipated for the commerical red king crab fishery.

(d) Impact on Recreation and Tourism

Most effects on recreation and tourism would be changes in economic values and noneconomic qualities. Changes in the number of users, property values, and visual qualities are examples. Refuges and National Park Service recreational lands would only receive low effects. Recreational beaches would receive low effects due to OCS population use, oil spills, and oil-spill cleanup activities.

CONCLUSION: Effects on recreation and tourism are low.

CUMULATIVE IMPACTS: In the cumulative case the coastal areas adjacement to the North Aleutian Basin Planning Area would continue to be affected by the proposal and previous sales in the North Aleutian area. Resource levels and development activity would be at levels commensurate with those outlined in the Sale 92 FEIS (USDOI,MMS, 1985). Because recreational activity in coastal areas is limited and industrial activity would be at a low level (two platforms) impacts on recreation and tourism would be low.

CONCLUSION: The cumulative effects are low.

(e) Impact on Archaeological Resources

Based on the mean-resource estimate (173 MMbbls), the pipeline-transportation scenario, and the transshipment terminal under the proposal, it is likely that both offshore and onshore cultural resources of the North Aleutian Basin planning area could be adversely affected to a minor degree.

Offshore oil and gas exploration and development activities (drilling-platform and pipeline trenching, feeder pipelines, and a landfall) could affect historic-shipwreck sites located in nearshore and offshore areas. Ships wrecked near Port Moller include the Leffie (1902), the Excelsior (1906), the John Currier (1907), and the Jessie-Minor (1911). In addition, there are seven other ships wrecked among the islands near Balboa Bay.

Although there are numerous shipwrecks that could be affected it is improbable that offshore prehistoric habitation sites would be found in the area therefore, the proposal would have no effect on offshore prehistoric sites.

Onshore, archaeological resources may be affected by oil spills as well as by installation of pipelines across the Alaska Peninsula oil and gas development facilities, and an attendant local population increase. Construction of airports and/or oil and gas pipelines over or adjacent to archaeological sites would directly affect archaeological resources. Oil spills would indirectly affect archaeological resources should cleanup equipment (bulldozers, trucks, or other heavy equipment) be moved overland from an air facility to the beach. If such transportation occurred, archaeological sites on the beach or nearshore could be damaged when roads were constructed and/or all-terrain vehicles were driven over them; however, existing laws protect archaeological sites, and it is expected that the adverse effects would be low. Areas of archaeological significance that may be affected by oil-spill-cleanup activities include Nunivak Island. Cape Newenham, Walrus Island, Port Heiden, Port Moller, Bogoslof Island, and the lower Alaska Peninsula and Unalaska and Unimak Island.

CONCLUSION: Effects on archaeological resources are low.

CUMULATIVE IMPACTS: The major actions affecting archaeological resources are the activities associated with federal and state oil and gas lease sales. Archaeological resources would be affected by OCS populations and activities in the Sales 70, 83, and 89 and 92 areas. Thier are discussions of cultural resources in the Final EIS's for Sales 70, 83 and 92 (USDOI, MMS, 1982; USDOI, MMS, 1983e USDOI, MMS, 1985).

Anticipated exploration and production infrastructure for the Navarin, St. George, and North Aleutian Basin could affect archaeological resources in the area. The combined effects of activities in these areas would increase population levels in Unalaska and cold Bay which are support base sites. These population increases could affect archaeological resources in the following way. For example, exploration and development personnel whose families live in Anchorage may want to seek hunting and fishing experiences in the northern Aleutian coastal area while recreating with their families. Such visitors would increase the probability of interaction with archaeological resources.

These types of effects would occur in the vicinity of the cities of cold Bay and Unalaska. The remained of coastal area surrounding the North Aleutian Basin Planning Area would primarily be unaffected.

CONCLUSION: The cumulative effects are low.

(f) Impact on Transportation Systems

The proposal would have high effects on Cold Bay, Balboa Bay, and the Alaska Peninsula particularly during the construction/development period. The pipeline corridor and terminal would be constructed in an area previously without any type of transport infrastructure, and large-vessel traffic would be introduced into an area with no large-vessel operations. In regard to the Cold Bay airfield, the influx of personnel during the construction/development period would significantly increase airport operations and passenger enplanements above present levels. The lessees may have to construct warehouse, dormitory, and very possibly hanger facilities to maintain their supply capabilities; however, many of these needed structures might already be constructed as part of exploratory activities for previous Bering Sea lease sales.

The effects of the proposal on Unimak Pass are expected to be low due to the low traffic volumes generated by the proposal. Effects of the proposal on Unalaska are expected to be moderate. The City of Unalaska already hosts one dedicated oil-support base, with additional facilities to be established in the near future. Competition for land between the fishing and oil industries could develop if both industries concurrently entered a maximum-growth period.

CONCLUSION: The proposal would have a high effect on transportation systems.

CUMULATIVE IMPACTS: The cumulative effects of oil development in the Bering Sea would be most evident in the vicinity of the transshipment terminal. According to one transportation scenario for the proposed action, all production for Sales 57, 70, and 83 would proceed by shuttle tankers to a transshipment terminal located in Balboa Bay. The size of the transshipment terminal could possibly exceed 150 hectares with an attendant airfield, deballasting tanks, and at least four loading docks or buoys. A small fleet of tugs to assist vessel maneuvers would be associated with the terminal.

Balboa Bay has some limiting factors which could preclude its extensive use for tanker traffic. Although depths throughout the bay generally exceed 21 meters, caution must be exercised in piloting a ship of that draft into the embayment. The loading of very large crude carriers (VLCC's--ships of 200,000 DWT or larger) would have to be conducted well out into the bay. The dimensions of the bay are such that tanker movements must be closely supervised by tugs. (The crash-stop length of VLCC is nearly 5 kilometers at 15 knots.) Through 1999, between 450 and 550 tankers ranging between 100,000 and 250,000 DWT may enter Balboa Bay. The accommodation of such a traffic level would involve close monitoring of all vessel movements.

CONCLUSION: The cumulative effect would be high.

(g) Impact on Military Uses

This is not a subject discussed in the Alaska OCS Region as there are no restricted areas.

(h) Impact on Subsistence-Use Patterns

This discussion summarizes subsistence effects for the North Aleutian Basin Unalaska and Cold Bay would be the respective marine and air support bases. The pipeline landfall would be in the Port Moller area. An overland pipeline would go to an oil terminal at Balboa Bay.

One oil spill of 1,000 barrels or greater is assumed. Subsistence resources (primarily salmon) used in the Bristol Bay region and, in particular, the lower Alaska Peninsula subregion could be disturbed however the effects on salmon are expected to be low (Section 15.a) Subsistence resources used by the residents of Nelson Lagoon and Sand Point would be the ones most likely to be effected. The effects would be expected to be very low because a single oil-spill would have little effect on fisheries resources. In the other areas, subsistence resources (salmon) are not likely to be affected by oil spills directly reducing the population of subsistence resources. For a discussion of the affects of oil spills on fisheries resources and marine mammals se section 15a.4.b and 15.a.4.c.

The effect of the enclave population at Balboa Bay and temporary and permanent residents in Nelson Lagoon and Sand Point would be low due to the great abundance of resources (salmon and Caribou) with the result of little potential for harvest conflict. These points are discussed in the sale 92 FIES Section IV.K. Effects on subsistence activities of the residents of Sand Point would be low because of the distance from the terminal. Any increased competition experienced by existing residents of Unalaska would probably be marginal compared with the effects due changes induced by population growth in the groundfish-processing industry.

The groundfish industry is forecast to about triple the resident population of Unalaska over the 15 years from 1985 to 2000, this increasing this population from 756 to 2,235. Subsistence-use patterns in Cold Bay are not expected to undergo a material change from those brought about by the normal growth of the community, let alone from OCS-related air operations, due to the relative abundance of local resources combined with the limited subsistence practices carried out in the community.

CONCLUSION: The overall effects on subsistence-use in the planning area would be low.

CUMULATIVE IMPACTS: Unalaska and Cold bay are potential marine- or air-support bases, respectively, for most all offshore areas in the southern Bering Sea because of the facilities available at each location and the competive advantage accrued with succeeding lease sales for continued industrial investment in support-base facilities. The expanded role of Unalaska as a marine-support base for OCS and related operations in the southern Bering Sea should contribute marginally to the level of effects on subsistence-use patterns expected from the predicted growth of groundfish-oriented industrial development. This and other forms of industrial development should be more readily accomodated with the expansion of the airport to handle jet aircraft. Historically, the community already has experienced considerable change in subsistence-use patterns, most recently as a result of the growth of the king crab industry. For a majority of the population, subsistence-use patterns are now beginning to resemble urban patterns of resource acquisition and use (individualistic, with few species used). Accelerated population growth resulting from groundfish-associated industrial development may increase the harvest pressure on selected subsistence resources and may require increased regulation of resource harvests as a result. Development and operation of the infrastructure to support industrial development also may remove or otherwise influence local habitat for subsistence resources. These factors could increase the cost to acquire subsistence resources through the need for wider mobility or the need to substitute for resources not acquired. Although a segment of the population that is unable or unwilling to gain sufficient income may be adversely affected by the growth experience, effects on the Unalaska population as a whole should result in the perpetuation of current patterns with only little modification.

As an outpost for metropolitan functions, Cold Bay has no deep historical tradition in subsistence practices and should experience little change in currently practiced subsistence-use patterns, which consist primarily of some setnetting for salmon, setting of crab pots, or beachcombing. The added population associated with OCS air support and a southern Alaska Peninsula oil and gas terminal may cause a need for added regulation of sport hunting and fishing because of increased harvest pressure, since hunting and fishing are the primary renewable-resource-harvest patterns in the community.

In the Bristol Bay region, the density of use of the Balboa Bay oil and gas terminal for transporting oil should be comparable to the level forecast for the proposal, since oil from the Norton, St. George and Navarin Basins is expected to be tankered directly to market rather than transshiped through Balboa Bay. State onshore oil and gas lease Sales 41 (Bristol Bay Uplands) and 56 (Alaska Peninsula) may increase vessel traffic to some extent if the Balboa Bya terminal is used and thus increases the likelihood of oil-spill risks to marine subsistence resources on the southern coast of the Alaska Peninsula and to Bristol Bay salmon that migrate along the Alaska Peninsula;.

Indirect effects on subsistence-use patterns could be realized, to a limited degree, from direct oil-spill effects on mature salmon which could result in a drastic reduction or curtailment of the commercial salmon catch to avoid marketing a tainted or thought-to-be tainted product. More fish than usual probably would be put by people in the region, should such an event take place; and increased pressure could occur on moose and caribou resources of the region.

CONCLUSION: The cumulative effect could result in low effects on subsistence in the planning area.

(i) Impact on Sociocultural Systems

For the purpose of effects assessment, it is assumed that effects on social, cultural, and political systems of organization could be brought about at the community- or regional-analysis level, predominantly by added population and industrial activities associated with the proposal. Potential effects are evaluated relative to the central tendency of introduced social forces to support or disrupt existing systems of organization, and to the duration such behavior.

Cold Bay: As a result of the proposal, the small, predominantly non-Native community of Cold Bay is expected to experience a small increase in population. The net effect of a small population change in Cold Bay should only marginally affect social, cultural, and political institutions existing there, since the character of activity and cultural orientation of the persons expected to be involved should be compatible with the historical experience of the community. Therefore, few, if any, changes are expected in the cultural values and orientations of the community.

Unalaska, the larger of the two potential host communities, should experience the boomtown effects of groundfish-induced industrial development and already introduced offshore-marine-support functions resulting from St. George, Navarin Basin and North Aleutian lease sales. From these aggregate activities (commercial fishing and oil development), but primarily from groundfish processing, the resident population is expected to approximately triple by the year 2000, with enclave population also expected to be of substantial proportions. The added contribution of the proposed action to the population and an insignificant addition to the overall enclave population in 1990.

Although relatively insignificant in magnitude, the added population introduced into Unalaska should contribute to the transiency and single-male-dominated social structure of the community. Whatever social discord may have ensured initially from the introduction of the OCS marine-support function (with previous lease sales) should not be aggravated to any great extent by the proposed sale. Perhaps more than other social effects, the added population attributed to the proposal should be expected to contribute to the trend of marginality and public dependency among the elderly and others unable and unwilling to gain financially from the boomtown conditions.

The trend toward the displacement of rural values and orientations, already evident in Unalaka, is expected to continue with the proposed action and the urban-industrial cultural system it represents. The resulting heterogeneity of value systems in the community should continue to cause intergenerational identity conflicts among residents, which could result increasingly in conflict, stress, and problems associated with subsistence abuse. Politically, the government structure of Unalaska (municipal administrators, the city council, commissions, and boards) should continue to be pressed to develop and maintain community growth-management policies, provide community facilities and services, and mediate the soical effects (increased substance abuse, family disorders, child abuse, displaced individuals, etc.) of expected boomtown conditions.

Bristol Bay Region: In the Bristol Bay region, the only communities expected to experience population growth as a result of the propose are the sites for an air-support facility in Cold Bay. No furher OCS-related facilities are expected to be established in the Bristol Bay region: therefore, effectsf caused by oil-industry population growth will be minimized except where facilities are placed.

The single oil spill of 1,000 barrels or greater expected could affect the social and cultural systems as a result of disturbances in subsistence-use patterns are expected in Bristol Bay; however, indirect effects from a major oil spill could temporarily cause a reduction or closure of the Bristol Bay commercial salmon fisheries for fear of producing a tainted product. The result of such a closure could cause a temporary shortage of cash income which would result in unmet subsistence needs, thereby causing a burden to family or institutional-support networks. Such an occurence could have ramifications in the social structure of the community and in subistence values, orientations, and dependencies.

Due to the interrelationship of kinship to subsistence production and distribution patterns (see Sec. III.C.5.), alterations in subsistence patterns could create some disintegration of the kinship system. In the smaller, predominantly Native communities, this effect would be more severe, since there are no institutional-support systems and such an effect would necessitate a heavier reliance on kinship networks to aid those in need when there is an inadequate subsistence harvest. In the event that there was unsatisfactory support from family or institutional networks, outmigration could occur and cause a break-down in family relationships and the kinship structure. Additional social and phsychological stress also could occur from a lack of stability in the social structure as residents seeking employment move to other communties. In addition, since subsistence and fishing as a means of livelihood are both core cultural values, the inability to pursue subsistence fishing, or even the threat to the residents' ability to fish could cause psychological stress in the communities. Despite the potential for such effects occurring as an indirect result of an oil spill, these effects are likely to be short-term and concenttrated in the larger communities of King Cove and Sand Point, and to primarily affect marginal fishermen. Although short-term effects from an oil-spill incident may occur, long-term change to the social and cultural systems would depend on the relative weakening of traditional stabilizing institutions through prolonged stress and disruption effects which are unlikely to occur under the proposal.

CONCLUSION: Sociocultural effects should be low.

CUMULATIVE IMPACTS: Given the concentration of support facilities for offshore oil in Unalaska, cumulative effects of all Bering sea sales primarily would fall on this community. Unalaska, the larger of the potential host communities, should experience the boomtown effects of groundfish-induced industrial development and already introduced offshore-marine-support functions resulting from St. George and Navarin Basin planning areas. From these aggregate activities, but primarily from groundfish processing, the resident population is expected to approximately triple by the year 2000, with enclave population also expected to be of substantial proportions. The added contribution of the proposal to the population is marginal at best. The added population attributed to the proposal should be expected to contribute to the trend of marginality and public dependency among the elderly and others unable and unwilling to gain financially from the boomtown conditions. In the cumulative case, moderate effects could be expected to result in Unalaska.

CONCLUSION: Moderate effects are expected on the sociocultural systems of Unalaska as a result of the cumulative activities.

b. Unavoidable Adverse Impacts

Section IV.B.11.b. presents a discussion of the unavoidable adverse impacts of the proposal for all Alaskan planning areas.

c. Relationship Between Short-Term Uses of the Environment and the Maintenance and Enhancement of Long-Term Productivity

Section IV B.11.c. presents a discussion of the relationship between short-term uses of the environment and the maintenance and enhancement of long-term productivity attendant to the proposal for all Alaska planning areas.

d. Irreversible and Irretrievable Commentment of Resources

Section IV.B.11.d. presents a discussion of the irreversible and irretrievable commentment of resouces attendant to the proposal for all Alaskan planning areas.

e. Impacts of a High Case Scenario

This section provides a discussion of the potential environmental impacts that could occur in the unlikely event that all unleased, undiscovered, economically recoverable hydrocarbon resources in the North Aleutian Planning Area are leased and developed as a result of the proposal. The estimated High Case hydrocarbon resources for the North Aleutian Planning Area are: 190 million barrels of oil and 1360 billion cubic feet of gas. These estimates are higher than the Base Case for the proposal. However, infrastructure expected to be used to explore and develop these resources includes 12 exploration and delineation wells, 42 development wells and 1 platform. This is not significantly different from the proposal (12 exploration and delineation wells 39 development wells and 1 platform). In addition, the estimated number of oil spills greater than 1,000 barrels remains at one, the same as the Base Case proposal.

It is important to point out that North Aleutian area does not have existing offshore development. Infrastructure for the high case are the same as the cumulative case. However, the high case assumes that the resource will be developed as a result of the proposed 5 year program lease sales, while the cumulative assumes that leasing and development will extend over future five year programs.

Production of an additional 17 million barrels of oil in the high case, over that estimated for the proposal. Could be carried out in the same time frame (35 years) as the proposal. In the high case scenario the number of exploration wells (12) and production platform (1) would be the same as those estimated for the proposal. Only the number of production wells would increase as a result of the high case. Forty-two production wells are anticipated in the high case while 39 are expected under the proposal. The drilling of 3 additional production wells in the high case would increase the amount of drill cuttings by about 8 percent. Drilling muds would not increase substantially in the high case do the recycling of muds for all wells drilled from a single platform. No additional manpower, pipelines, or other support infrastructure would be expected in the high case.

Impacts to all resource categories analyzed may increase slightly, however, the significant differences in impacts cannot be differentiated from those described for the base case for Alternative I.

f. Impacts of Alternative II-Subarea Deferrals

This alternative evaluates the deferral from leasing in the 5-year program of 13 additional subareas (14 subareas are deferred under Alternative I - the Proposed Acting). One of these additional subareas is in the North Aleutian planning area.

Unimak Pass

This option would defer from leasing about 48 whole or partial blocks from the area available for leasing. (See Fig. II.A.2.a-4) A contiguons subarea of about 162 blocks in the St. George planning area is also considered for deferral under this alternative. This description and analysis of impacts covers both of these contiguons areas. The deferral area consists of all unleased blocks 3 to 30 miles north of Unimak Pass. In the Unimak Pass area the Tertiary sequence reaches a total thickness of more than 20,000 feet beneath the Bering Canyon and more than 10,000 feet in Amak Basin, but thins considerable as it laps onto the flank of the northwest-trending Aleutian ridge. Potential traps underlying the shelf include anticlines, fault traps, stratigraphic onlap of Tertiary sediment onto basement highs, and sub-unconformity truncations within the basement complex. Potential traps beneath the Bering Canyon include stratigraphic pinchout of turbidite sands, rare fault-bounded traps and possible low-relief diapirs. The overall resource potential of the deferral area is moderate relative to the overall North Aleutian and St. George planning area.

Air and water quality is considered to be pristine throughout the planning area. Pollock, halibut, and other groundfish (including eggs and larvae) spawn in the area. The eggs-larvae of one or more species may be in the upper water layers for much of the year. Adults and the demersal eggs/larvae of other groundfish species (yellow fin sole, Greenland turbot, Pacific cod) occupy water levels near the bottom.

Herring, capelin, smelt, and sand lance are food for salmon, other finfishes, and the marine mammals and birds of the eastern Bering Sea. In the St. George Basin Planning Area, herring are regaining commercial importance after several decades without a fishery. Herring annually migrate inshore for spawning in the spring and to offshore overwintering waters in the fall. Both immatures and adults probably occur in coastal waters from late spring through early fall. Spawning areas near the proposed Unimak Pass deferral area have not been identified; however, Japanese data indicate that migration occurs through the deferral area during spring, and there apparently is an offshore movement in the fall.

All American species of Pacific salmon transit waters of this planning area as adults returning to Alaska streams to spawn, and as immatures enroute to the North Pacific Ocean to rear. These migrations are seasonal, annually ranging from early May through the end of September or perhaps later. As analyzed for the proposal, these migrations might be temporarily blocked or diverted by contact with oiled waters, with possible mortality and sublethal effects. The salmon food supply also might be reduced. Immature and adult salmon tend to migrate in schools that are relatively close to the surface; thus, the fish could be subject to contact by oil spills. Salmon also frequently orient their migration routes toward coastlines and off headlands.

Red and blue king crab, tanner crab, hair crab, pandalid shrimp, and several clam species are the principal shellfish and mollusks in the deferral area. Portions of the deferral area are major spawning habitat for the red king crab, *C. opilio* tanner crab, and other shellfish and mollusks.

High bird densities occur in Unimak Pass. In particular, shearwaters forage here in summer and large numbers move between the Norther Pacific Ocean and the Bering Sea. Flocks of over 1 million individuals have been observed in the pass in July and August, and movements in excess of 25,000 birds/hour for extended periods have been recorded in April and May. Other species are especially abundant in migration. For example, in late March, April, and May, murres move through the pass typically at about 500 birds/hour with as many as 12,000/hour recorded. Mean density of all species in Unimak Pass in summer, including fulmars, storm petrels, gulls, and murres and other alcids, is 224 birds/km^2, or about 720,000 birds at any given moment.

Northern fur seal, harbor seal, Steller sea lion and sea otter migrate through and/or spend foraging time in this deferral area. A majority of the gray whale population (13,000-15,000) passes through Unimak Pass during spring and fall migrations each year. Gray whales may be in Unimak Pass from late March through June and from May and late November to early December. Bowhead and right whales visit the St. George Basin very infrequently (bowheads in late winter to early spring and right whales in summer). There have not been any sightings of either species in this subarea. Sei and blue whales are generally present during the summer months although not with any regularity, since their preferred summer feeding habitats are south of the St. George Basin. Fin whales are more frequently observed in this area than either the blue or sei whales, especially during the summer. A small local population of humpback whales may summer in the waters around Unalaska Island, a portion of which would be included in this deferral. Sperm whales prefer deeper, oceanic waters, and generally would spend only a minimal amount of time in the deferral area while migrating to and from summer feeding areas.

The Unimak Pass deferral would defer leasing in a number of blocks in which there is a significant amount of fishing for C. bairdi tanner crab.

Deferral of this subarea slightly reduces the probability of oil spill contacts to any of the finfish resources within the deferral area. Deferral of blocks north of Unimak Pass would decrease the risk of oil spills occurring within the deferred blocks and contacting large numbers of adult salmon migrating to the Bristol Bay region spawning streams from the North Pacific and Gulf of Alaska, and by juvenile salmon migrating in the opposite direction. This represents only a small decrease in risk, primarily from platform spills, as tanker traffic through the pass would still occur with its inherent risk of oil spills. Deferral of these blocks north of Unimak Pass would decrease oil spill risks to a major portion of the red king crab and C. opilio tanner crab spawning habitat. However, given the broad distribution and large abundance of these species groups (shellfish and mollusks), and the relatively small areal extent of even a large spill (1,000 barrels or greater), the effects on these species from oil spills would be minimal.

By eliminating potential platform spill sites north of Unimak Pass, this deferral provides additional time for any spills to undergo weathering and cleanup before approaching the pass. Any spills approaching or occurring in Unimak Pass in the spring, summer, or fall could result in moderate effects. The potential for major impacts to marine and coastal birds exists if a spill occurred during a period of concentrated bird use of the pass. This alternative could slightly reduce oil spill effects on marine mammals along the shelf-break habitat north of Unimak Pass, but would not provide much protection from noise disturbance to migrating whales, which pass through Unimak Pass. Aircraft and vessel traffic would have similar levels of noise. The risks from oil spills would be slightly reduced; most risk would be from tankering through the pass. The deferral of blocks north of Unimak Pass would not change the level of oil industry activity elsewhere in the planning area. The potential for slight losses of fish harvest through placement of platforms would be eliminated from this area:

(g) Impacts of Alternative III - Add a Sale in the Straits of Florida

Adding a sale in the Straits of Florida will not effect this planning area. Under Alternative III, all sales proposed in Alternative I - the proposal, would be held. Therefore, the expected impacts of Alternative III are identical to Alternative I for this planning area.

h. Impacts of Alternative IV-Biennial Leasing

Resource estimates for Alternative IV (Biennial Leasing) are 180 MMbbls. of oil and 1310 BCF of gas as compared to 173 MMbbls. of oil and 1258 BCF of gas for Alternative I. The number of sales increase from 1 to 2.

Development assumption for Alternative IV concerning geophysical activity, exploration wells (12) and production platform (1) are the same the same as those identified for Alternative I. Only the number of production wells (41) necessary to produce the estimated resource level differs from Alternative 1 (39 production wells for the proposal). Estimates of drilling muds, cuttings and formation water for Alternative IV would be slightly greater than those estimated for the proposal because 41 production wells would be necessary. Also one oil spill of 1,000 barrels or greated is expected under this alternative.

i. Impacts of Alternative V - Acceleration Provision

Alternative V (Acceleration Provision) would accelerate the sale schedule outlined for Alternative I by one year. However, the accelerated schedule would not shorten the current presale process.

Under Alternative V the resource estimates (173 MMbbls. of oil and 1258 BCF of gas) and development assumptions would be identical to those for Alternative I. Because these assumption are identical the effects of Alternative V on all resource categories would be the same as Alternative I except that they would be accelerated by one year.

j. Impacts of Alternative VI - Defer Leasing in Six planning Areas: North Atlantic, Washington and Oregon, Northern

California, Central California, Southern California, and North Aleutian Basin

Selection of Alternative VI would defer leasing in this planning area. Therefore, impacts associated with exploration, development, production, and transportation of oil from within this planning area would not occur as a result of this 5-year program.

k. Impacts of Alternative VII - No Action

Under this alternative, the Secretary of the Interior would propose not to schedule any oil and gas lease sales for this proposed 5-year program. All potential impacts from OCS oil and gas activities which could result from implementation of this 5-year program to the physical, biological, and socioeconomic environment would be eliminated.

Oil and gas are currently the Nation's primary energy source. Even with a vigorous conservation program, the United States' demand for energy will continue to grow. With the adoption of Alternative VII, the oil and gas that would have been available as a result of this proposed program would no longer contribute to the national domestic production during the life of the program.

With the removal of the potential oil and gas into the national energy reserves, it would necessitate the increased production of energy from other conventional and nonconventional energy sources (see Appendix C) and/or increases in import levels from foreign sources. Impacts resulting from the development of the alternative energy sources are summarized in Section II.A.7. and further discussion of alternative energy sources can be found in Appendix c.

16. St. George

a. Alternative 1

(1) Interrelationship of Proposal with other Projects and Proposals

The proposal includes the holding of one sale in the St. George Planning Area. It is estimated that the sale would produce about 135 million barrels (MMbbls) of oil and 1,261 billion cubic feet of gas over a 35 year period. These resources would be produced from 35 production wells from 1 platform. In addition to the oil and gas, up to 1,500 MMbbls of formation water could be produced. Approximately 520 thousand barrels of drilling muds and fluids and 734 thousand barrels of drill cuttings could be discharged into the sea over the life of the proposal. About 11 exploration wells would be drilled. It is anticipated that 1 support base will be expanded and that at least 1 onshore facility will be developed.

Section IV.B.11.a.(1) presents a discussion of the interrelationships of the proposal with other projects and proposals for all Alaskan planning areas.

(2) Projects Considered in Cumulative Impact Assessment

Section IV.B.15.a.(2) presents a discussion of the projects considered in the cumulative impact assessment for this planning area.

(3) Physical Environment

(a) Impact on water quality

Under normal offshore operations, varying degrees of water-quality degradation will occur as a result of oil and gas exploration and development. Potential water quality degradation resulting from increased OCS oil and gas operations is derived from resuspension of bottom sediments through exploration and development activities and pipeline construction, discharge of sanitary and domestic wastes, discharge of formation waters, discharge of drilling fluids and muds, and accidental hydrocarbon discharges due to spills, blowouts, and chronic small-volume spills.

Sediment Resuspension: Eleven exploration/delineation wells, 35 production wells, and 1 production platform are estimated to be required as a result of the proposed action. Sediment resuspension is likely to occur as a result of setting anchors for semisubmersible exploratory rigs and driving piles for production platforms. The amount of sediment resuspended from these activities will be very low, restricted to the area immediately around the specific activity, and will likely be reduced to background levels within several hundred meters downcurrent from the activity.

In addition to the siting of rigs and platforms, if oil and gas is found, an offshore pipeline could be emplaced to transport produced oil and gas to a transshipment facility. Pipeline construction activities would result in the resuspension of sediments along the route of the pipeline; however, these sediments would rapidly settle following completion of activities in a specific area.

Deliberate Discharges From Platforms: OCS exploratory vessels and production platforms will discharge drilling fluids in bulk quantities, along with lower-level releases of petroleum hydrocarbons and sanitary wastes from waste-water discharge sources. OCS production platforms will also be discharging bulk quantities of petroleum formation waters.

Effects on water quality are to be expected only in the immediate vicinity of discharges. Approximately 520 thousand barrels of drilling muds and 734 thousand barrels of drill cuttings could be discharged. Drilling fluids typically form two plumes when discharged in the water column. Within minutes of discharge, the heavier materials settle to the seafloor, usually within a few hundred meters of the discharge point. Lighter, suspended particles and dissolved materials remain in the water column for several hours. These materials will eventually settle out adjacent to and downcurrent from the discharge point. Solids dilutions of up to 10,000:1 at 100 meters from the discharge point have been measured from OCS field studies.

Assuming a 200 meter radius mixing zone around a drilling structure, up to .13 square kilometers of the planning area would have impaired water quality during some part of the year while exploration and delineation activities are ongoing. This impairment would exist during periods of actual discharge, but would rapidly dissipate afterward. During production, with 1 platform operational, .13 square kilometers of the planning area would have impaired water quality. Discharges at production locations, however, would continue over several years.

Total production of formation waters is estimated to be up to 1,500 MMbbls with proportionately more waters being produced during the later stages of field life. The mixing zone would likely be of the same magnitude as that for drilling mud discharges, affecting only a few tenths of a square kilometer over the entire proposed lease sale. Most of the formation water--that produced in later years as the field declines--would likely be reinjected into the formation to preserve pressures.

Thus, water quality on the order of less than a square kilometer will be affected by deliberate discharges of drilling fluids from exploration or production platforms. Deliberate discharges other than drilling fluids and formation waters are expected to have a very low effect on water quality because of their small volumes and the area's dilution potential. Degradation of water quality would persist less than a year at exploratory platforms, but would continue intermittently as wells were drilled through the years at production platforms. Thus, water quality effects from deliberate discharges would be low.

Oil Spills: In addition to permitted and planned discharges, accidental oil spills are likely to occur. Based on experiences in other OCS areas, one oil spill of 1,000 barrels or greater is projected if oil is produced from the proposed lease sale.

Because of unavoidable chronic and accidental discharges of oil, measurable degradation of existing pristine water quality is very likely to occur in the study area. Plumes of dissolved hydrocarbons from a major spill (10,000 barrels or more) could be detectable over the low background levels for perhaps 100 kilometers. Occasional tar balls or mousse (water-in-oil emulsions) would be expected. Likely increases in dissolved hydrocarbon concentrations, however, should appreciably degrade water quality only in limited areas and for short periods.

Decomposition and weathering processes for oil are slowed appreciably in colder waters. In marine waters, advection would reduce effects of any similar release of toxic oil fractions or daughter products, except possibly to isolated waters of embayments with limited circulation. Regional long-term degradation of water quality below State and Federal standards because of hydrocarbon contamination is very unlikely. Thus, water quality effects from hydrocarbon releases should be low.

CONCLUSION: Effects on water quality from the proposal would be low.

CUMULATIVE IMPACTS: Cumulative effects include those from the proposal plus those arising from previous sales and other planning areas, including potential tankering of Canadian crude through the area. Cumulative risk of oil spills would significantly, but temporarily, degrade water quality in the planning area. In the cumulative case, 4 oil spills of 1,000 barrels or greater would be expected. Overall, oil pollution would be increased from that for the proposal alone, but impacts from infrastructure placement and drilling discharge on water quality would not be greater than for the proposal due to the timing of the particular sales, their production/construction schedules, and the duration of anticipated effects. Significant long-term effects on regional water quality would still be very unlikely.

CONCLUSION: Impacts on water quality would be expected to be low.

(b) Impact on air quality

In the St. George Basin, effects on air quality from the proposal are expected to be low. Projected peak emissions from one platform would not exceed State or Federal air quality limitations unless concentrated nearshore in small areas. In that event, existing control technology would ensure attainment of standards, although air quality would not be absolutely pristine near facilities. Onshore emissions also would be subject to Federal Prevention of Significant Deterioration (PSD) review and modeling.

CONCLUSION: Effects on air quality from activities of the proposal would be low.

CUMULATIVE IMPACTS: Cumulative effects of offshore emissions also are expected to be low. The cumulative amount of offshore emissions which could occur nearshore may be estimated by combining the emissions projected for the St. George/North Aleutian Basins. In the cumulative case, 2,050 MMbbls of oil would be expected to be produced from 14 platforms in the St. George and North Aleutian Basins. The combined production-related emissions would exceed Department of the Interior air quality analysis exemption levels for all pollutants if all operations were located approximately 5 kilometers (3 miles) offshore near the St. George/North Aleutian boundary (165°W longitude). This is highly unlikely, especially because prior tract bids in the St. George Basin indicate interest much farther offshore and widely dispersed.

Cumulative air quality effects would be seen in Balboa Bay as a result of the piping of natural gas from the North Aleutian and St. George Basins to an LNG facility at that bay. This facility would have to meet all Federal and State air quality and Class II PSD standards. As a result, control technology would be required.

Because án oil-storage and marine-loading terminal at Balboa Bay would be required to meet State and Federal ambient air quality and Class II PSD limitations, no unavoidable effects on air quality are foreseen.

CONCLUSION: Cumulative effects of the proposal on air quality would be low.

(4) Biological Environment

(a) Impact on plankton and benthos

The planktonic eggs and larvae of many important fish species are present year-round over much of the St. George Basin area. Oil concentrations of less than 1 ppm are lethal to the eggs and larvae of some species. Crustacean larvae are the most sensitive organisms tested to date, with LC50's as low as 400 ppm by volume. However, the areal extent of one 1,000 barrel or greater oil spill (extending over 100-300 sq.km. of surface waters and 100 sq.km. of the benthos) as compared with distribution of plankton, indicates very low effects on this group.

Available data is adequate to assure that drilling fluids (520,000 bbls) and cuttings (734,000 bbls) discharged from exploratory and production drilling from one platform in the St. George Basin would also have no measurable effect on pelagic or planktonic organisms. These same discharges would cause some localized effects on benthic life due to burial over areas of 50 to 150 meters from the discharge point. These effects would ameliorate--probably within 1 to 2 years or less--as the area is recolonized and currents and biological activity disperse the discharged material. The majority of benthic effect studies to date have found little evidence of significant physical, chemical, or biological impacts extending beyond 800 to 1,000 meters down-current from a well site.

Effects on plankton are discussed further in the following section on fish, which includes assessment of effects on early, planktonic life stages of fish.

CONCLUSION: The overall impact on plankton and benthos of the St. George Basin planning area is very low.

CUMULATIVE EFFECTS: Given the extremely large numbers of populations, the loss due to four 1,000 barrel-or-greater oil spills expected in the cumulative case would not be identifiable or quantifiable from natural mortality.

CONCLUSION: These cumulative impacts on plankton and benthos would be very low, same as assessed for the proposal.

(b) Impact on fish resources

Based on morphology and habitat, discussion of effects on Bering Sea fisheries resources may be grouped into four major segments: (1) demersal or benthic groundfish; (2) herring, capelin, smelt, and sand lance; (3) the salmonids; and (4) shellfish and mollusks.

Groundfish: Oil spills are assessed as being the major agents with potential to affect the groundfish resources of the St. George Basin and other areas of the eastern Bering Sea.

A large number of fish have been subjected to toxicity studies using a variety of petroleum hydrocarbons (Malins, 1977); and a comprehensive review of the effects of these substances on Alaska species also has been compiled (Rice et al, 1983). The following discussion of the biological effects of spilled oil on marine organisms is based on Malins and Hodgin (1981); Rice (1981); and Thorsteinson et al. and Curl et al. in "Proceedings of a Synthesis Meeting: The St. George Basin Environment and Possible Consequences of Planned Offshore Oil and Gas Development" (Hameedi, 1981).

The one assumed oil spill of 1,000 barrels or greater could contact and have lethal or sublethal effect to the groundfish that are contacted by it. Based on analysis developed at the St. George Basin Synthesis Meeting, held in Anchorage, Alaska, in 1981, concentrations of dissolved oil known to kill or injure larvae of fish and shellfish (20 ppm) from a 50,000 barrel release of oil would exist over an area between 100 and 300 km in the bottom and upper mixed layers after about 10 days. Oil from a spill of this size could be delivered to the benthos where it could contact groundfish in toxic concentrations over an area of about 100 km after about 10 days. Oil spills of lesser volumes, which are more likely to occur, would contact much more reduced ocean areas over this 10-day period. The few square kilometers contacted by oil before weathering and dissipation are an insignificant portion of the thousands of square kilometers of the eastern Bering Sea groundfish habitat.

Discharges from drilling platforms have much lesser, limited impacts than oil spills. The adverse effects of drilling muds and fluids (520,000 bbls), drill cuttings (734,000 bbls) and formation waters (up to 1,500 MMbbls) would be largely dissipated within a hundred meters of the single discharge point, and would not be detectable beyond a kilometer of the discharge point (Hameedi, 1981).

CONCLUSION: The overall impact on all groundfish species of the St. George Basin Planning Area is very low.

CUMULATIVE IMPACTS: Oil and gas exploration/development in other Bering Sea and Alaska onshore areas, including the Bristol Bay uplands and existing leases in the St. George Basin and Norton Sound Planning Areas, could have adverse impacts on the groundfish. Increased regional development, including commercial fishing, is also a potential cumulative impact on groundfish.

Transport of additional oil from the Chukchi Sea, Norton Sound, and St. George Basin Planning Areas, and Canadian Beaufort increases the probability of oil spills. Tanker transport of oil from Alaska onshore areas could also result in an increased probability of oil spills. However, these spills would be distributed over all of the Bering Sea.

Development of commercial fisheries and increased commercial harvest of groundfish species now harvested only incidentally to the other species (i.e., plaice) would have a cumulative effect on this fish group. These activities will cause some reduction in the groundfish biomass of the eastern Bering Sea.

CONCLUSION: These cumulative impacts on groundfish would be very low, same as assessed for proposal.

Herring, Capelin, Smelt, and Sand Lance: The one oil spill of 1,000 barrels or greater attributable to this proposal could have impacts on herring, capelin, smelt, and sand lance. This is due to the concentrations of oil in the water column that would prove lethal or sublethal to these fish. Herring migrating through the Bering Sea enroute to nearshore areas in the spring or overwintering areas in the fall, may pass through spill areas. With hydrocarbon concentrations generally well below 1 ppm following oil spills in open-ocean environments and adult fish experiencing mortality following exposure to 3 to 5 ppm, few mortalities are expected to occur in offshore waters. The areal extent of an oil spill extending over 100-300 sq.km. of surface waters and 100 sq.km. of the benthos would not affect a regional population.

An oil spill which contacted nearshore spawning/rearing areas used by this group of fish could have increased impacts on the more vulnerable life stages of this group, however, this is not anticipated. Overall, oil spill impacts are assessed as very low.

Discharges of drilling muds and fluids (520,000 bbls), drill cuttings (734,000 bbls), and formation waters (up to 1,500 MMbbls) would have a very low adverse impact on Bering Sea forage fish populations due to the limited number of discharge locations (1 production platform), small area of influence (within 100 meters), and limited period of discharge (minutes). The types of seismic-energy sources projected to be employed have been demonstrated to be innocuous to fish beyond a few feet of the source.

Therefore, the impacts on forage fish would be very low.

CONCLUSION: The proposal would have a very low impact on herring, capelin, smelt, and sand lance.

CUMULATIVE IMPACTS: Activities which may produce cumulative impacts on this diverse group of forage fishes include other Federal and State ongoing and proposed petroleum development, commercial fishing operations, and increased transportation requirements in the region influenced by increased oil industry activities.

Nearshore areas on the Alaska Peninsula and into Bristol Bay, where these forage fishes are found, would in all likelyhood only be affected by spills originating in the North Aleutian Basin Planning Area. Areas of significant herring spawning in Port Moller-Herendeen, Port Heiden, and inner Bristol Bay would be expected to only have very low impacts.

CONCLUSION: In the cumulative case, herring, capelin, smelt, and sand lance are not expected to experience greater impacts than the assessed very low impacts for the proposal.

Salmonids: Oil spills would be the major agent affecting the salmon resources of the St. George Basin under the proposed action. Contact with oil spills during salmon migrations may, dependent on the spill characteristics, hydrocarbon type, and environmental conditions, divert salmon migration in the open ocean or delay entry to spawning streams in the nearshore area; with increased predation on the fish and corollary reduction in their food supply from the impacts of spilled oil on the organisms on which salmon feed.

There are indications that adult Pacific salmon avoid monocyclic petroleum hydrocarbons at concentrations as low as 3.2 ppm (Weber, et. al., 1981), and that juvenile coho salmon avoid monocyclic aromatics derived from crude oil at concentrations as low as 2 ppm (Maynard and Weber, 1981). Newly emerged salmon fry are the most susceptible life stage. In lab and field studies, adult salmon are found to avoid seawater-soluble-reaction hydrocarbon concentrations less than 1.6 ppm, but not less than 0.75 ppm (Patten, 1977).

These impacts, however, should be very low because the one expected oil spill of 1,000 barrels or greater would only affect the salmon that would be in the area at the time of the spill. Salmon spawning populations could be in this area from early May through the end of July; and rearing immature salmon, estimated there from July through the end of November annually. Salmon would then be vulnerable to oil spills contacting this area for 6 to 7 months during the year.

Drilling muds (520,000 bbls), drill cuttings (734,000 bbls), and formation waters (up to 1,500 MMbbls) do not have a significant impact on migrating/rearing salmon populations due to the limited area that they alter in the vicinity of drilling operations (100 meters from the discharge point). Pipelines also would have very limited spatial and temporal impact on salmon during the construction period. Seismic surveys that employ low-energy, non-explosive sources also are innocuous to salmonids.

CONCLUSION: Impacts on Bering Sea salmonid populations for this proposal would be very low.

CUMULATIVE IMPACTS: Oil and gas exploration/development in other areas of the Bering and Chukchi Seas, as well as possible tanker transport of pending production from Canadian Beaufort Sea production, would cumulatively increase the expected number of 1,000 barrel or greater oil spills. In the cumulative case, 5 oil spills in this category would be expected.

Increases in commercial fishing operations and other non-petroleum industry activities in the region may also have cumulative effects.

CONCLUSION: In the cumulative case salmon would not be expected to experience greater impact than the very low adverse impact as assessed for the proposal.

Shellfish and Mollusks: Hydrocarbons lost to the marine environment of the St. George Basin Planning Area could have adverse impact on blue king crab, red king crab, *C. bairdi* and *C. opilio* tanner crab, hair crab, brown king crab, and pink and humpy shrimp; the principal commercial shellfish of the area. Shrimp resources, however, are much depleted and now support only small-scale efforts in some Unalaska Island bays.

The planning area could principally affect the commercially important shellfish of the eastern Bering Sea by an oil spill contacting the benthic adults. Such contact would likely result in mortalities or sublethal effects to adults. An oil spill, however, would not cause any significant reduction in regional shellfish populations. The areal extent of the spill measured in a few square kilometers, would be only a minute fraction of the thousands of square kilometers of the Bering Sea that are considered habitat for shellfish and mollusks.

Given the large population of juvenile and adult blue king crab, the loss due to a single oil spill of 1,000 barrels or greater would not be identifiable or quantifiable from natural mortality or commercial-harvest data.

Increased offshore oil and gas development in the region will also involve increased discharge of drilling muds and fluids (520,000 bbls), drill cuttings (734,000 bbls), and formation waters (17 to 150,000 MMbbls). These impacts, however, will not be significant. Drilling muds, fluids, and formation waters could have both lethal and sublethal impacts on shellfish; however, their benthic habitat would be affected over only a small area around the single discharge point (within 100 meters). Seismic surveys would have no affect on shellfish of the eastern Bering Sea. Likewise, increased offshore construction will not change the regional populations of shellfish and mollusks.

CONCLUSION: The impacts on shellfish and mollusks attributable to the proposal would be very low.

CUMULATIVE IMPACTS: Eastern Bering Sea shellfish and mollusks could be further affected by planned offshore oil and gas lease sales--both State and Federal--elsewhere in the Bering and Chukchi Seas.

Some offshore areas where shellfish and mollusks occur have increased oil spill risks in the cumulative case; however, the oil spill impacts on the regional populations are not expected to increase significantly from those of the proposal. Shellfish and mollusk populations, widely distributed, could not be contacted in any significant number by even a major oil spill.

CONCLUSION: In the cumulative case shellfish and mollusks are not expected to experienced greater adverse impacts than the assessed very low effects of the proposal.

(c) Impact on marine mammals

Eighteen species of non-endangered marine mammals--northern fur seal; sea otter; Pacific walrus; Steller sea lion; Pacific harbor, spotted, ribbon, and bearded seals; minke, killer, and beluga whales; harbor and Dall's porpoises; short-finned pilot whale; Pacific white-sided dolphins; Bering Sea beaked whale; goosebeak whale; and giant bottle-nose whale commonly occur in a portion of or throughout the St. George planning area and are very likely to have some interaction with OCS activities. Oil pollution and disturbance due to increased human activity and habitat alterations could adversely affect marine mammal populations found in the planning area. The general impacts of oil spills, noise and disturbance, and habitat alterations on marine mammals are discussed in Section IV.B.11.a.(4) Impact on Marine Mammals in the Gulf of Alaska Planning Area.

Approximately 871,000 northern fur seals or 73% of the world's population that breed and pup on the Pribilof Islands and forage within the St. George Planning Area during the summer are the population of marine mammals at greatest risk from the one 1,000 barrel or greater oil spill that is assumed as a result of the proposal. If an oil spill occurred very near St. Paul Island during the spring or summer fur seal breeding and pupping season, a portion of the 871,000 fur seal population on the Pribilof Islands (for example 10,000 to 20,000 seals) may come in contact with oil on the beach or in the water. A very large spill is very unlikely to contaminate several major rookeries present around the Pribilof Islands. Perhaps as many as 10,000 to 20,000 females and pups present on 2 or 3 contaminated rookeries could be killed. This could represent a moderate impact on the overall northern fur seal population. If an oil spill occurred offshore within feeding and migration habitat of the northern fur seal during the summer when most of the population are present in the area, the rapid dispersion and evaporation of the spill in the open environment of the St. George Basin would greatly reduce the chance that large numbers of widely distributed, highly mobile foraging seals would come in contact with oil slicks. Perhaps a few hundred seals would come in contact with the dispersed spill and die as a result. This would represent a low or very low impact on the overall population. Thus, overall oil spill impacts on fur seals are likely to be moderate.

Although large numbers (5,000 or more) of sea lions may be exposed to an oil spill contacting the Pribilof Islands, few individuals are likely to be seriously affected (see Section IV.B.11.a.(4) Impacts on Marine Mammals in the Gulf of Alaska Planning Area). Oil impacts on pelagic prey of fur seals and sea lions are likely to temporarily reduce the numbers or availability of these food sources within localized areas near the spill site. Because fur seals, sea lions and cetaceans have very versatile food habitats and exhibit highly mobile foraging habits, the temporary local reduction of prey (such as fish or squid) that would be associated with an oil spill is likely to have little impact on these marine mammal populations. Oil spill impacts on walruses, sea otters, and ribbon, spotted, and harbor seals in the planning area are likely to involve few individuals being directly exposed to the spill, and impacts on food sources would be localized near a spill site. Oil spill impacts on these species are likely to be low, although moderate impacts on sea otters are possible if a spill occurs in the Unimak Pass area.

Although cetaceans could be exposed to an oil spill or gas condensates on the water surface or in the water column, only highly stressed individuals could possibly suffer serious sublethal impacts [see discussion of generic effects under Sec. IV.B.11.a.(4)] from the probable, very brief exposure to concentrated hydrocarbons; thus oil spill impacts on cetaceans in the St. George planning area are likely to be very low.

Human disturbance of fur seals and sea lions on the Pribilof Islands is a major concern. Seismic activities offshore would cause some brief avoidance responses by seals and sea lions near the operation. This level of disturbance (brief flight reactions) is likely to be of little consequence to these animals thus of very low impact. Low-flying aircraft and human activities near the rookeries during the pupping season could significantly reduce pup survival and greatly increase physiological stress on these populations. Air support for the proposal is assumed to be centered out of Cold Bay or the Pribilofs and marine-support traffic is expected to be centered out of Unalaska. Most of the air- and boat-support traffic is not likely to pass near the Pribilof Island fur seal and sea lion rookeries or disturb breeding and pupping seals and sea lions. Thus, the number of aircraft flights or vessel passage associated with the proposal near the fur seal and sea lion rookeries are likely to be few. This level of disturbance is likely to represent low impacts on pinnipeds and sea otter populations in the St. George Basin lease area.

CONCLUSION: The proposal could have moderate impacts on fur seals and sea otters and low impacts on other nonendangered marine mammals.

CUMULATIVE IMPACTS: Projects that could have cumulative impact on marine mammals in the planning area include possible oil tankering through Unimak Pass associated with OCS leases in the Bering Sea, increases in other commercial and fishing vessel traffic through Unimak Pass, possible oil tankering from Balboa Bay and other development facilities there that could be associated with North Aleutian Basin and St. George Basin Planning Areas, and commercial fishing activities in the Bering and north Pacific. Cumulative vessel traffic through Unimak Pass will increase the chance of vessel collisions and tanker spills (crude or fuel oil) in Unimak Pass and the St. George Basin Planning Area. Oil spills in the Unimak Pass area would pose a serious threat to local sea otter populations and the 871,000 northern fur seals that migrate through the pass during the spring and fall. Although possible oil spills in Unimak Pass from cumulative tanker and other commercial vessel traffic would be rapidly dispersed and subject to evaporation and weathering, several thousand to perhaps tens of thousands of fur seals could come in contact with one or more oil spills in Unimak Pass and result in the death of several thousand to perhaps tens of thousands of fur seals. This could represent a moderate impact on the northern fur seal population. Oil spills that may be associated with cumulative marine traffic in Unimak Pass could also have moderate impacts on sea otters with the possible loss of several hundred to several thousand animals. However, other pinnipeds and cetaceans are likely to suffer low to very low impacts from oil spills in Unimak Pass. (See Section IV.B.11.a(4) Impacts on Marine Mammals in the Gulf of Alaska Planning Area).

Noise and disturbance associated with increases in marine traffic and increases in air craft associated with cumulative oil development and increases in the human population in the Pribilof Islands would result in the temporary and perhaps long-term displacement of marine mammals particularly fur seals and sea lions from haulout sites and rookeries that are adjacent to air and/or vessel traffic routes. If the air and/or vessel traffic is frequent enough to cause long-term or permanent displacement of a portion of a species regional population to a less favorable habitat (haul-out-rookery site), impacts could be moderate if a species population was reduced and the recovery to its former level took 10 years or more. However, pinnipeds and other marine mammal populations may habituate to cumulative sources of noise and disturbance after perhaps a few years such that the effect would be moderate. Marine mammals could also be incrementally affected by changes in abundance and distribution of prey species due to commercial fishing in the Bering Sea and North Pacific Ocean, particularly if bottom fisheries are established in Alaska. Fur seals and other pinniped populations may suffer cumulative population declines associated with the loss of high numbers of animals entrapped in discarded fishing gear or losses from active gill net fisheries.

CONCLUSION: Cumulative impacts would be moderate on fur seals and sea otters and low on other nonendangered marine mammals.

(d) Impact on coastal and marine birds

The impacts of an oil spill on birds would vary with season, duration of exposure, and volume and composition of oil. Winter spills in the southeastern Bering Sea could affect overwintering cormorants, seaducks, gulls, and alcids. In addition, fulmars, shearwaters, storm petrels, dabbling ducks, shorebirds, and alcids could be affected by summer spills. Loons, ducks, geese, shorebirds, and alcids would be the groups most adversely affected by spills during spring and fall migration. In August and September, large numbers of flightless adult and young murres and other alcids are concentrated on the water surrounding colonies prior to post-breeding dispersal. Embayments containing marshes or major river deltas, and nearshore areas where prey organisms are concentrated, are the most vulnerable habitats. Oil spills that contact these areas could result in direct mortalities to thousands of birds. The adverse impacts of such a spill would be low for most species because of the high population numbers associated with these areas.

High impacts could occur if large concentrations of a species or population, which occurs only in one area, is contacted by the one expected oil spill of 1,000 barrels or greater. Red-legged kittiwakes and Alaskan thick billed murres could be severely affected if an oil spill were to contact the Pribilofs during breeding season. The majority of the world population of red-legged kittiwakes and Alaskan thick billed murres nest in the Pribilofs Islands. Whiskered auklets and tufted puffins could experience high effects for similar reasons if oil spills were to contact their foraging areas in the Eastern Aleutians during breeding season. Additionally, the disturbance of breeding populations of birds (particularly black brant) by aircraft operations could occur at both St. George and Cold Bay. These impacts would include abandonment of nesting habitat, physiological stress, and loss of eggs and young during panic flights. This would ultimately lead to a decline in the productivity of the population affected.

CONCLUSION: Impacts on regional populations of marine and coastal birds are expected to be low. Impacts on local populations in the Pribilofs could be high.

CUMULATIVE IMPACTS: Transport of additional oil from the Norton Sound, Navarin Basin, and St. George Basin Planning Areas, and Canadian fields, substantially increases the likelyhood of spills occurring, oil inundation of important biological resources areas, and the expected number of spills. In the cumulative case, five oil spills of 1,000 barrels or greater would be expected. Likewise, risk to birds overwintering south of the pack ice is likely to increase. Risks in other areas adjacent to probable tanker routes from other lease areas indicates that moderate impacts could occur.

Additional tanker traffic associated with Bering Sea lease sales is likely to increase the probability of oil spills in Unimak Pass. This suggests the potential for high impacts when large numbers of marine birds are using the pass and adjacent waters during migration and breeding periods. Additionally, the transport of oil through a cross-peninsula pipeline associated with the North Aleutian Basin Planning Area, also substantially increases the risk in the Port Moller area. Migratory waterfowl and shorebirds staging in this area in spring and fall could experience moderate and, for some species, high effects if a spill were to enter Port Moller or adjacent Nelson Lagoon.

While many seabirds do not undertake extensive migration, some do migrate through or overwinter in or near other planning areas and therefore are subject to increased oil spill risk. Storm petrels and fulmars may feed at considerable distances from their colonies, which may bring them into contact with spills in other planning areas. Spills and/or disturbances which adversely affect breeding stocks of certain seabird species at more than one major colony could result in a significant reduction of their regional populations. Most waterfowl and shorebirds are highly migratory and thus likely to migrate through, overwinter in, or breed near other State or Federal areas.

Other factors which may make a substantial contribution to cumulative impacts include mortality resulting from seabirds accidentally captured in salmon driftnets, the long-term impacts of habitat degradation, disturbance, and possible alteration or reduction of prey-species populations.

Disturbance during construction of support facilities may cause some marine birds to be displaced from their nest sites. Additionally, increased vessel and aircraft traffic and habitat degradation may result in some long-term decline in numbers of nesting birds. The overall impacts of such activities are expected to be low. The cause of apparent prey-species decline may be linked to climatic factors, increased commercial fishing effort in Alaskan waters, and/or other factors (Springer et al., 1983, 1984, 1985). A combination of such factors could result in significant declines in regional seabird populations.

Where major populations of marine and coastal birds occur, such as in the Pribilof Islands, Unimak Pass and the adjacent eastern Aleutians, high effects could be experienced if oil spills contacted these areas in which high densities of birds were present. Disturbances from aircraft traffic (particularly in Cold Bay), which affect the survival and productivity of marine and coastal bird populations are likely to intensify any effects of petroleum development on marine and coastal bird populations.

CONCLUSION: Cumulative impacts on regional marine bird populations could be moderate over much of the planning area. Impacts to local populations in the Pribilofs may be high.

(e) Impact on Endangered and Threatened Species

All eight endangered whales have been observed in or adjacent to the St. George Planning Area. The Aleutian Canada goose nests on Chagulak Island in the far southwest corner of the planning area. The short-tailed albatross may occasionally occur in the area. The historic range of the Eskimo curlew included the Pribilof Islands, although none have been sighted in Alaska for many years. There are no listed plant species in areas adjacent to the planning area. Refer to Section IV.B.11.a.(4) for specifics on impacts to endangered species that may occur as a result of the proposal.

A formal Section 7 Endangered Species Consultation of MMS with NMFS and the FWS was conducted for the proposed sale 89 for the St. George Basin Planning Area. The biological opinion from the FWS was dated 11/04/83 and covered American and Arctic peregrine falcons, short-tailed albatross, Eskimo curlew and Aleutian Canada goose. The biological opinion from NMFS is dated 03/01/85 and covered potential effects of exploration activities on endangered whales. See Chapter V for a further description of the consultation process for Section 7 of the Endangered Species Act of 1973.

The St. George Basin is not along the primary migration route of any of the endangered species. Sperm whales will be most likely in areas beyond the shelf break, bowheads only visitors during heavy ice years. Blue and sei whales seldom migrate beyond the Aleutian Chain. Fin whales are likely to be exposed to most oil and gas activities, especially in the summer feeding area between the Pribilof Islands and Unimak Pass. Humpback and gray whales are mostly located nearshore except for those migrating along the shelf break towards Cape Navarin.

Based on the resource estimate, 35 development/production wells will be drilled from one platform. One oil spill of 1,000 barrels or greater is expected. One half of the oil will be offshore loaded and transported through Unimak Pass to a transshipment terminal in Balboa Bay. A spill occurring in Unimak Pass would have the potential for contacting the most whales although currents and wind would determine the life of the slick.

Vessel and air support will be based the Pribilofs or Cold Bay and Unalaska. Tanker traffic would be in areas of whale use especially Unimak Pass. If utilization of Unimak Pass becomes intolerable to endangered whales (unlikely) utilization of other passes in the Aleutian Chain would occur. Noise-producing activities are most likely to occur in the shallower waters of the planning area as there currently are no rigs available that might be used in waters beyond the shelf break.

CONCLUSION: Impacts from oil and gas activities associated with the proposal are expected to be very low for endangered birds and the blue, sei, sperm and bowhead whale. Impacts to the fin, gray, right and humpback whales are expected to be low.

CUMULATIVE IMPACTS: Development of sales and the associated activity levels could increase the likelihood of whale/oil spill interaction especially for whales traversing many planning areas. The exposure to tankers from other planning areas passing through Unimak Pass will increase the probability of an oil spill occurring and contacting whales. The tankers will also use areas of potential whale feeding use. Displacement of whales could be expressed in the long run by lowered blubber stores and a reduced fecundity level.

It is unlikely that whales would be displaced by tanker traffic. However, some whales could be temporarily displaced or disrupted while feeding; overall noise disturbance and oil spill impacts are not expected to preclude a successful migration or disrupt cetacean health (blubber stores and fecundity levels). Because endangered birds (Aleutian Canada goose and Eskimo curlew) are infrequent visitors of the planning area, cumulative OCS developments would have little effect on these birds.

CONCLUSION: Long-term cumulative impacts to endangered whales are expected to be low and very low for endangered birds.

(f) Impact on estuaries and wetlands

These topics are discussed and impacts analyzed where they occur as habitat for the fish and wildlife species in (4)(a) through (4)(f) in this section.

(g) Impact on areas of special concern

These areas are all habitats for the fish and wildlife species in (4)(a) through (4)(f) and impacts are discussed as they occur in the planning areas.

(h) Impact on Marine Sanctuaries

There are no marine sanctuaries in the Alaska OCS Region.

(5) Socioeconomic Environment

(a) Impact on employment and demographic conditions

The search for and discovery of oil and gas within the St. George Planning Area could create employment opportunities and consequently increase population levels. These changes have both positive and negative attributes, thereby giving an indication of the socioeconomic well being of communities of the State or regions with the State.

This proposal could generate a region-wide total of about 585 jobs during peak activity. This is based on estimates made in past EIS's for the Alaska OCS Region for similar activities in similar areas. The bulk of the jobs (perhaps 90+%) will be filled by workers living in enclaves near the job site.

The general pattern is one of small employment effects in the exploration phase and fairly large effects during the development phase (starting in 1991) with most jobs in both the exploration and development phases filled by commuters living in the petroleum industry enclave. By contrast, it is expected that the moderate number of new jobs created during the production phase (starting in 1991) would be filled somewhat by permanent residents of a community.

A State wide peak population increase of about 640 persons could be associated with the projected employment increase. Of that number a small proportion may live in a small town or village associated with development activity. The bulk of the new population (families of enclave living workers) could live in Anchorage, The Matinuska Valley or on the Kenai Peninsula. Impacts are potentially more significant in those areas of small present populations near which offshore-related activities may be located.

Some additional employment opportunities for local residents would be created in the communities of St. George and St. Paul. The only reductions in joblessness could occur at St. George and St. Paul, where current and projected future unemployment is extremely high. The City of St. George might benefit from property taxes on an oil storage terminal and LNG plant. It is possible that negative economic effects could occur at Unalaska/Dutch Harbor in the form of port congestion, an increased rate of price inflation (including prices for rental housing), and housing shortages. Any changes to fish and other marine resources of the area, or to fishing gear, could have negative economic effects on residents of both, as well as on other communities in the region.

CONCLUSION: For the region as a whole, the impact is expected to be moderate.

CUMULATIVE IMPACTS: Exploration and development of petroleum resources in the Navarin, St. George, and North Aleutian Basins would provide additional employment opportunities for local residents of St. Paul or St. George, Unalaska, and Cold Bay. Additional employment opportunities would result from increased support base activities in these locations. The cumulative effect of Federal oil and gas development in the Bering Sea could substantially increase regional employment and populations.

CONCLUSION: Cumulative employment and subsequent population growth will be moderate both regionally and at the local level.

(b) Impact on coastal land uses

The impacts on land uses and existing plans would be primarily associated with the following types of uses: (1) siting of onshore developments serving offshore leases (air- and marine-support bases, marine terminals, and pipelines); (2) land demands resulting from increased residential populations; and (3) effects on existing land uses such as subsistence activities.

Most of the land in the region is in National Wildlife Refuge status or under the ownership of Native corporations. Due to the small amount of land available for development in the region, competition between existing uses and onshore developments may create land-use conflicts primarily in areas identified as potential air- and marine-support bases and pipeline routes. New land uses--such as onshore staging areas, temporary construction camps, or supply bases--could displace potential uses in areas originally projected for use as commercial, residential, or industrial sites.

The development scenario for the St. George Basin utilizes Unalaska as a marine-service base because of its strategic location near Unimak Pass, good natural anchorage, and existing marine infrastructure. Air support would probably be located in Cold Bay. The existing marine-support facility at Captain's Bay should be adequate to support exploratory drilling activities. This existing facility and those which may be constructed as a result of future OCS activities should be adequate for industry's needs. Competition for industrial lands between the oil industry and the burgeoning groundfish industry should be minimal. Thus, facility-related land-use impacts could be low.

The Unalaska community-development plan has allocated 1,276 acres of land for residential uses in four categories according to density of dwellings and character of development. Based on the comprehensive plan, enough developable, residentially zoned land exists to accommodate residential demands of OCS and groundfish activities. The land in question is owned largely by a native corporation, which at this time has no short-term plans for land sales.

St. Paul Island has very little existing industrial infrastructure. If all the estimated resources are developed, about 145 acres could be used for construction of a service base, marine terminal, and pipeline landfall. Because suitable waterfront sites are at a premium, there could be some problems between OCS related developments and any future commercial fishing projects.

CONCLUSION: The impact on Unalaska and Cold Bay as a result of facility and residential land-use demands would be low. Siting of a service base, marine terminal, and pipeline landfall could have moderate effects on land uses on St. Paul.

CUMULATIVE IMPACTS: Additional facilities would be required in Cold Bay and Unalaska to support exploration and development in the Navarin, St. George, North Aleutian, and Shumagin Basins. This is particularly true for Unalaska; which, in addition to providing OCS facilities, is expected to emerge as a major port for the burgeoning groundfish industry. The additional facilities' requirements would increase competition for limited docking facilities.

CONCLUSION: The cumulative impacts of development activities on land uses in Unalaska, Cold Bay, and St. Paul would be moderate.

(c) Impact on commercial fisheries

Factors that could result in adverse effects on the commercial fishing industry include: (1) elimination or foreclosure of fishing area by the presence of exploration rigs, production platforms, subsea completions, and pipelines, resulting in a possible loss of harvest; (2) gear conflicts, resulting in loss or damage to fishing gear, harvest loss, and business downtime; (3) oil spills resulting in gear fouling, preemption or closure of fishing areas, or direct loss or contamination of harvest; (4) loss or damage to fishing vessels through collisions with oil industry vessels; and (5) competition for support services, infrastructure, and labor.

Vessel traffic associated with oil exploration and development in the St. George Basin Planning Area could potentially contribute to loss of crab pot and long line gear by fishermen. Supply vessels traveling between the anticipated OCS-support base at Unalaska and the planning area would likely travel through the primary fishing grounds. Also, seismic-vessel activity associated with the proposal would likely occur in areas where these fisheries take place.

Seismic surveys are expected to be performed during the period June through September, coincident with fishing seasons in the eastern Bering Sea. Assuming that it is not possible to foreclose seismic surveys during crab seasons, it is probable that some crab pot lines could be severed and pots lost. Crab pots are also stored in designated ocean areas during the closed season, however, seismic surveys and other vessel traffic could avoid these areas.

Large concentrations of gear may also be stored in the water, both immediately prior to and after the fishing season, effectively lengthening the time period of potential contact between seismic and supply vessels. This is especially true around the Pribilofs.

With crab pots unevenly distributed over the proposed St. George Basin Planning Area and seismic-survey lines undetermined pending exploratory drilling, it is not possible to estimate precisely the loss of crab pots from this activity. A lower level of oil and gas exploration activity than projected in this proposal indicated less than one-tenth of one percent of the tanner and blue king crab pots in these fisheries as being contacted by seismic-survey vessel operations (Centaur, 1984). Presumably, with communication and cooperation, between the fishing industry and seismic contractors conflicts could be avoided and crab pots and gear loss due to seismic survey operations could be reduced or eliminated. Overall, the expected loss of crab pots and long line gear in the St. George Basin due to OCS activity would be low.

Potential adverse impacts on the commercial fishing industry of the St. George Basin Planning Area include elimination or foreclosure of fishing areas by the presence of offshore facilities (one platform), with subsequent loss of harvest; gear conflicts resulting in loss or damage to fishing gear, harvest loss, and business downtime; oil spills resulting in gear fouling (one spill of 1,000 barrels or greater is expected), closure of fishing areas, and direct loss or contamination of harvest; loss or damage to fishing vessels through collisions with oil industry vessels; and competition for support services, infrastructure, and labor.

Loss of harvest through foreclosure of fishing areas by offshore facilities (platform and pipelines) would be very low due to the extremely small area affected (1 production platform). If discoveries are made only within the area of geological potential, crab pot loss in the Pribilof Island fisheries through supply boat traffic and seismic surveys is projected to be very low. If discoveries are made closer to the Pribilofs or in areas where boats would be required to travel to and from the Pribilofs through highly concentrated crab-fishing areas, crab pot losses could increase. Longline loss due to vessel traffic is also projected to be extremely small during peak years of oil industry activity. Trawl gear damage would be considerably less than one incident per year.

One oil spill of 1,000 barrels or greater, if it occurred in or near fishing areas while the season was in progress, could foul crab pot buoys or groundfish trawls and cause temporary foreclosure of fishing grounds. Fishermen may be able to avoid these areas; however, if the spill occurred in the most highly productive areas, competition in alternative fishing areas could increase, causing a loss in total catch and income to the fishermen. However, due to the very low probability of a spill happening (27 percent), and the relatively low catch of salmon in the Aleutian Islands, effects are expected to be very low.

Competition for marine support services and infrastructure would be low, with some benefit from oil-related increases in the local availability of repair services. Collision risks through increased vessel traffic would slightly increase, but not perceptibly. Competition for labor between the two industries would not be significant.

CONCLUSION: Overall effects of the proposal on the commercial fishing industry are expected to be very low.

CUMULATIVE IMPACTS: Activities resulting in cumulative impacts to the commercial fishing industry of this region include existing and proposed Federal lease sales in the Bering Sea. These include Sales 70, 89, and 101 in the St. George Basin; Sales 83 and 107 in the Navarin Basin; and Sale 92 in the North Aleutian Basin. All of these lease sales would result in increased oil-industry-vessel traffic in and out of Dutch Harbor, increased number of platforms and pipelines in the southeastern Bering Sea, and the potential for additional oil spills from oil production in these areas, or from tankering of Canadian oil or oil produced from the proposed Barrow Arch (Sale 109) and Norton Sound (Sales 57 and 100) through the proposed lease area.

The potential adverse impacts on commercial fisheries of the southeastern Bering Sea would include the elimination or foreclosure of fishing areas by the presence of 12 offshore platforms, with subsequent loss of harvest; gear conflicts from supply boat or seismic boat traffic, resulting in loss of fixed gear (crab pots or longlines), loss of harvest, and downtime; gear fouling, closure of portions of fishing areas, and direct loss or contamination of harvest resulting from oil spills; loss or damage to fishing vessels through collisions; and competition for support services, infrastructure, and labor.

Centaur's and Associates (1983) recently analyzed the magnitude of the impacts from these cumulative Bering Sea lease sales on the commercial fishing industry of this region, in line with their projected increase in domestic fishing activity. The scenario assumptions used in their analysis deviated slightly from those of this proposal; however, the conclusions were judged to be approximately the same as those reached for this proposal.

In summary, their projected harvest loss resulting from preemption of fishing area by oil industry facilities was less than $24,000 (1982 dollars) in the year 2007 (peak year). Pot loss for all Bering Sea lease areas was calculated not to exceed 1,205 pots lost during 1997, the peak year of oil industry vessel traffic according to the existing schedule. Longline-gear-loss incidents in 1997 are projected not to exceed two in the halibut fishery and 599 in the Pacific cod fishery. Trawl-gear-damage incidents are estimated to number 25 in 2007 (peak year), averaging $45,000/year in gear damage and $25,000/year for lost fishing time. Collisions with fishing vessels would be at the rate of the every 79 years as of 1997, instead of the projected rate of one every 69 years without oil industry development.

The port of Dutch Harbor/Unalaska would likely be the major marine-support staging area for almost all Bering Sea oil development activities. Harbor congestion from the cumulative lease sales would probably be minimal, considering current plans for dedicated oil industry dock space in Captain's Bay, which is located south of the major concentration of fishing industry activity. Competition for labor would also be minimal, with the possibility of a positive benefit from additional employment opportunities during periods of poor earnings in the fisheries. Further, the increase in local availability of repair services could also benefit the fishing industry.

The number of oil spills projected for all of the Bering Sea Planning Area, including tankering from the Norton Sound and Barrow Arch areas and Canada, would be about 20 spills of 1,000 barrels or greater. Considering that these spills would occur over all of the Bering Sea region, and over the varying periods of exploration and development of each field (35 years or greater), it is conceivable that only a relatively small area would be affected by a spill at any one time. The severity of impacts on commercial fisheries would depend on what area the spill occurred in: some relatively small areas of the Bering Sea have very productive fisheries where activity and gear are concentrated and where catch and income loss due to gear fouling or closures could be high if a spill occurred during the fishing season. On the other hand, many other areas contain very low concentrations or no fish, an oil spill would have a very low impact on commercial fisheries. Generally, inner Bristol Bay, the Aleutians near Unimak Pass, the area north of Unimak Pass as far as 57°N latitude, and the Pribilof Islands area are locations where an oil spill could damage to commercial fisheries operations.

CONCLUSION: Overall, cumulative impacts on the southeastern Bering Sea fisheries are likely to be very low.

(d) Impact on recreation and tourism

Recreational use of coastal areas adjacent to the St. George Planning Area is extremely limited due to the region's scant population and distance from major population centers. Oil and gas development in the St. George Basin would increase the population of Unalaska and St. Paul as a result of support base activities. However these small population increases would have little effect on regional recreational use.

The one oil spill of 1,000 barrels or greater, which is expected to result from oil and gas development, could effect recreational uses if it contacted coastal areas of the Pribiloff and Aleutian Islands. However, such a spill would have a short-term, low effect since recreational use is light and oil spill clean-up activities would be expected to remove any traces of oil in recreational areas.

CONCLUSION: Impacts on recreation and tourism are low.

CUMULATIVE IMPACTS: Because recreational use of coastal areas in the Aleutian Island is extremely limited, cumulative oil development in the St. George Basin would have little effect on recreation and tourism.

CONCLUSION: Cumulative effects on recreation and tourism are expected to be very low.

(e) Impact on archaeological resources

Activities related to oil exploration and development, such as emplacement of platforms, laying lengths of pipelines from platforms to shore, and laying branching feeder pipelines could affect historic shipwrecks which took place in the area. Known shipwrecks dating from 1885 through the early 1900s occurred in the lease area. The principal areas where pipelines and/or OCS-related populations might adversely affect shipwrecks is at Port Moller. Ships wrecked near Port Moller are the *Leffie* in 1902, the *Excelsior* in 1906, the *John Currier* in 1907, and the *Jessie Minor* in 1911. Due to the protection provided by in-place laws and regulations, effects from such activities on shipwrecks would be low.

Oil spills could indirectly affect onshore cultural resources in the following manner: bulldozers, trucks, and other heavy equipment may be moved to the oil spill cleanup area from an airport in the vicinity of the spill. Therefore, oil spills could affect onshore cultural resources or other cultural resources, such as shipwrecks, because of the use of cleanup equipment transported over archaeological sites during cleanup. Adverse effects on offshore cultural resources are unlikely to occur because the chance that any prehistoric offshore resources exist is low; and by inference the effect of the proposal would be low for offshore prehistoric resources.

CONCLUSION: Effects on archaeological resources are low.

CUMULATIVE IMPACTS: Cumulative effects on archaeological resources would be caused by future and past Federal oil and gas leasing. Although development activities would increase, it does not appear that an interaction with archaeological resources would occur because it is unlikely that any offshore prehistoric resources exist in the St. George Basin.

CONCLUSION: The cumulative effects are low.

(f) Impact on transportation systems

The scenario for the proposed action postulates a combination of offshore loading in the southern Bering Sea and onshore loading at a tanker transshipment terminal located on St. Paul Island. Communities affected by the proposal will include St. Paul, Unalaska and Cold Bay. Because the proposal under the subject five-year plan will be the third for the region much of the required infrastructure may be already in place by the beginning of their exploration and development periods.

Air support for the proposal as well as others proposed for the Southern Bering Sea is expected to issue primarily from the Cold Bay airfield, marine support for the planning area is expected to issue primarily from Unalaska. A tanker loading terminal and additional marine and air support facilities would be located on St. Paul Island. The Cold Bay airfield can service up to 60 operations per hour. The fields' limitations are in its paucity of hangar and terminal facilities. Massive offshore operations may require the construction of additional aircraft parking space as well as heliopads which maybe constructed off airport per on the supply depots located near the field. Marine support facilities at Unalaska are expected to expand rapidly once hydrocarbons are located in the Bering Sea. One 16 hectare base is currently operating at Unalaska. Others can be expected to be constructed should the proposed Federal sales prove to have hydrocarbons. Support boat traffic is not expected to prove a hindrance to fishing vessel movements; however, some competition for dock space could occur should the growth of the fishing industry accelerate.

In regard to the tanker loading terminal which may be located on St. Paul Island, the construction of such a facility may have already commenced by the end of this decade. Hydrocarbons produced from the proposal would serve to feed the facility and prolong its operational life. Tanker traffic issuing from the facility would overtime prove to be a significant component of barge vessel traffic transiting the Ninimak Pass.

CONCLUSION: The proposal would have a moderate effect on transportation systems.

CUMULATIVE IMPACTS: The proposal is a part of a chain of proposed Federal actions which will span the Bering Sea and which will ultimately focus their developmental effects an a limited number of sites; principally, the Pribilof Islands, Unalaska and the Cold Bay airfield. The other major industry within the Bering, commercial fishing, has tended to concentrate its regional onshore activities at Unalaska. The cumulative action of the two industries may cause competition for shore front acreage suitable for development and the eventually the displacement of one of the industries. However, considering the resources of the proposal in relation to the projected activities within the Bering Sea it is concluded that its contributions would be a significant addition to total effects both in quantity of resources and timing of development.

CONCLUSION: Cumulative effects would be moderate.

(g) Impact on sociocultural systems

Effects of the proposed action on the sociocultural systems of Unalaska are expected to be minimal and marginal compared to the effects of growth conditions expected to be created by fisheries-oriented industrial development. In Cold Bay, the character of population and employment relations associated with the proposed action are compatible with the historical, social, and cultural experience of the community, whereas the political system of organization would be subject to considerable stress in attempting to develop and carry out growth-management policies.

Siting an oil and gas terminal on the Pribilof Islands could produce adverse effects within the Orthodox community located there unless mitigated through local means. Depreciation of subsistence values and orientations could ensue from employment and other interaction with the new economic sector of the islands. Accommodating a sizable non-Aleut or non-Orthodox resident population on the island could hasten this depreciation as well as introduce the basis for creating a new controlling social force within the community. The mechanism for negotiating and maintaining countervailing growth-management policies appears to exist, however, through the village corporation's control of access to land on the island.

CONCLUSION: Effects on sociocultural systems are expected to be moderate on the Pribilof Islands and very low for Cold Bay and Unalaska.

CUMULATIVE IMPACTS: In Unalaska, the predicted growth of groundfish-oriented industrial development, as discussed in Section IV.B.1.b.(1), should be the driving force for change in local sociocultural systems. The OCS Marine-support-base function plays a considerably more minor role. In the aggregate, however, the effect on sociocultural systems in Unalaska should be more of duration and degree of disruption than of institutional change beyond that which was initiated with the crab industry boom. This should be true in Cold Bay as well, in that the character of the community is not expected to substantially change as a result of serving a major air-support role and supporting the operation of an Alaska Peninsula oil and gas terminal beacause of the similarity in employment relations expected to be involved and the resultant character of the population that can be expected from such relations.

In the Pribilof Islands, adverse cumulative effects on subsistence resources from southern Bering Sea lease sales and from tankering could contribute to increased levels of stress already set in motion by Federal withdrawal from sealing. And, in this context, it would be tempting to court elements of the petroleum industry to establish facilities on either of the islands. If such were the case on either island, the potential for increased interisland rivalry and social disruption among extended families situated on both islands could arise and have disruptive effects on local sociocultural systems, but not to the extent of creating a tendency toward displacing Orthodox systems of behavior.

CONCLUSION: Impacts would be moderate for the Pribilof Islands and very low for Cold Bay and Unalaska.

(h) Impact on subsistence-use patterns

Subsistence-use patterns on the Pribilof Islands would be adversely affected if the fur seal population were subject to an oil spill--the total annual supply of fur seal meat could be reduced by from 50- to 100-percent. One oil spill of 1,000 barrels or greater is assumed. This outcome should be the case whether or not there are direct biological effects in terms of abundance or distribution of the fur seal. An oil spill incident could cause the NMFS to terminate or vastly reduce the commercial and/or subsistence fur seal harvest for the length of time necessary to determine the effects on the fur seal population. This length of time could conceivably be for more than one year.

Subsistence activities (sealing) of the residents of the Pribilofs would be most likely to be interfered with. The effects would be low because of the sharing of support base activities with Unalaska and Cold Bay.

Any increased competition experienced by existing residents of Unalaska would probably be marginal compared with the effects due to changes induced by fisheries-oriented development. Subsistence-use patterns in Cold Bay are not expected to undergo a material change from those brought about by the normal growth of the community, let alone from OCS-related air operations, due to the relative abundance of local resources combined with the limited subsistence practices carried out in the community. The effect of the enclave population on St. Paul would be small due to the character of the harvest and the local control exerted over local resources.

CONCLUSION: Based on the type of subsistence harvest and the population's subsistence-use characteristics, the impact would be high in the Pribilof Islands and low in the remainder of the region.

CUMULATIVE IMPACTS: Increased air and marine traffic in Cold Bay and Unalaska, industry activity in the Pribilofs, and tankering of crude to a major oil terminal on the Alaska Peninsula could increase the threat of disturbance, interference, and oil spills on the subsistence resources used by the residents of the planning area. The marginal increases in traffic would have low effects on subsistence around Unalaska and very low effects around Cold Bay. High effects on subsistence in the Pribilof Islands could occur.

CONCLUSION: The cumulative effect of oil spills and other OCS industry activities could result in low effects on subsistence in all areas but the Pribilofs where it would be high.

(i) Impact on military uses

This is not a subject discussed in the Alaska OCS Region as there are no restricted areas.

b. Unavoidable Adverse Impacts

Section IV.B.11.b. presents a discussion of the unavoidable adverse impacts of the proposal for all Alaskan planning areas.

c. Relationship Between Short-Term Uses of the Environment and the Maintenance and Enhancement of Long-Term Productivity

Section IV B.11.c. presents a discussion of the relationship between short-term uses of the environment and the maintenance and enhancement of long-term productivity attendant to the proposal for all Alaska Planning Areas.

d. Irreversible and Irretrievable Commitment of Resources

Section IV.B.11.d. presents a discussion of the irreversible and irretrievable commitment of resouces attendant to the proposal for all Alaskan Planning Areas.

e. Impacts of a High Case Scenario

This section provides a discussion of the potential environmental impacts that could occur in the unlikely event that all unleased, undiscovered, economically recoverable hydrocarbon resources in the St. George Planning Area are leased and developed as a result of the proposal. The estimated High Case hydrocarbon resources for the St. George Planning Area are: 640 million barrels of oil and 5,990 billion cubic feet of gas. These estimates are higher than the Base Case for the proposal. Infrastructure expected to be used to explore and develop these resources includes 66 exploration and delineation wells, 168 development wells and 6 platforms. This is significantly different from the proposal (11 exploration and delineation wells 35 development wells and 1 platform). In addition, the estimated number of oil spills of 1,000 barrels or greater is 2 (1 more than the proposal).

It is important to point out that St. George does not have existing offshore development. Resource estimates and infrastructure for the high case are the same as the cumulative case. However, the high case assumes that the resource will be developed as a result of the proposed 5-year program lease sales, while the cumulative assumes that leasing and development will extend over the future 5-year programs lease sale.

(1) Impact on Water Quality

Sixty-six exploration wells, 168 production wells and 6 platforms are estimated for the high case. Sediment resuspension is likely to occur as a result of setting anchors for exploratory rigs and driving piles for production platforms. The amount of sediment resuspended from these activities would be very low and restricted to the immediate area around the activity.

Effects on water quality are to be expected only in the immediate vicinity of discharges. Amounts of muds, cutting, and formation water discharged into the environment would be about six times as high as the proposal. Assuming a 200 meter radius mixing zone around a drilling structure only .78 square kilometers of the planning area would have impaired water quality during production. Thus effects from deliberate discharges would be low.

In addition to permitted and planned discharges, oil spills are likely to occur. Two oil spills of 1,000 barrels or greater are projected. Regional long-term degradation of water quality below State and Federal standards because of hydrocarbon contamination is very unlikely. Water quality effects from hydrocarbon releases should be low.

The overall impact on water quality as a result of the high case would be low.

(2) Impact on Air Quality

Impact on air quality would be the same as the proposal, low.

(3) Impact on Plankton and Benthos

The planktonic eggs and larvae of many important fish species are present year-round over much of the St. George Basin area. Oil concentrations of less than 1 ppm are lethal to the eggs and larvae of some species. Crustacean larvae are the most sensitive organisms tested to date, with LC50's as low as 400 ppm by volume. However, the areal extent of two 1,000 barrel or greater oil spills (extending over 100-300 km3 of surface waters and 100 km2 of the benthos) as compared with distribution of plankton, indicates very low effects on this group.

Available data is adequate to assure that drilling fluids and cuttings discharged from exploratory and production drilling from two platforms in the St. George Basin would also have no measurable effect on pelagic or planktonic organisms. These same discharges would cause some localized effects on benthic life due to burial over areas of 50 to 150 meters from the discharge point. These effects would ameliorate--probably within 1 to 2 years or less--as the area is recolonized and currents and biological activity disperse the discharged material. The majority of benthic effect studies to date have found little evidence of significant physical, chemical, or biological impacts extending beyond 800 to 1,000 meters downcurrent from a well site.

The overall impact on plankton and benthos of the St. George Basin Planning Area is very low.

(4) Impact on Fish Resources

Development of the high case resources (640 MMbbls) would produce effects on all fisheries resources that are similar to, but slightly greater than, those discussed for the proposal. The effects associated with oil spills would be slightly increased from those discussed for the proposal due to the increased number of spills expected for the high case. Two spills of 1,000 barrels or greater are expected in the high case, which approximately doubles the number expected from the proposal. This would essentially double the level of direct effects--i.e., mortality of eggs and larvae of groundfish and shellfish. However, given the broad distribution and large abundance of these resources, effects would be relatively insignificant even with the increase in spills. Due to the increase in oil volume, vulnerable nearshore areas used by salmonids and herring (and other forage species) would be at slightly greater risk than discussed for the mean case. Effects from drilling discharges would also be greater, considering the larger number of sites to be drilled during exploration (66 exploratory wells) and the number of wells drilled and platforms (6) used during production and development. However these effects would be negligible due to the limited area affected by these discharges. While the level of geophysical operations would increase, the harmless nature of the explosive devices used (airguns and sparkers) would preclude any adverse effects on fisheries resources. The aggregate effects of all these factors on the fisheries resources from the high case would be very low.

(5) Impact on Marine Mammals

Overall effects on pinnipeds and sea otters due to increased oil spill and disturbance effects associated with the high case would be greater than described for the proposal. An increase in petroleum resources could be expected to result in elevated oil spill contact for important marine mammal migration routes and feeding areas compared to the proposal. Such an increase could lead to some increase in effects, especially on fur seals which depend heavily on the shelfbreak area between Unimak Pass and the Pribilof Islands during migration and breeding periods. Localized changes in fur seal and sea lion distributions could occur as a result of increased disturbance associated with higher levels of industry activity. However, overall oil spill and disturbance effects are not likely to exceed moderate.

(6) Impact on Marine and Coastal Birds

Increasing projected oil resources from 135 to 640 MMbbls would increase the expected number of oil spills from 1 to 2 which potentially could be associated with this proposal.

Such an increase would be reflected in greater risk to bird populations. Although this suggests that a large increase in oil resources would substantially increase the risk of high effects from oil spills in the Pribilofs, transport of all resources across the Alaska Peninsula would lessen the expected increase in oil spills.

Elsewhere, the risk of moderate effects would increase most importantly in the eastern Aleutian Islands and Unimak Pass. Effects could range from moderate to high.

(7) Impact on Endangered and Threatened Species

Overall effects on endangered species from direct and indirect effects of oil spills or disturbances associated with development and the transport of extracted oil would be greater than those described for the proposal. Since the high case assumes about 5 times the level of petroleum resources as estimated for the proposal, an increase in spill-contact would be expected. Increased noise and disturbance associated with higher levels of development which would be expected with the high case could result in more localized changes in distribution and/or density of potentially sensitive endangered species. Effects on migrating whales (especially gray and humpback whales) could be low.

Impact on endangered birds is expected to be very low.

(8) Impact on Estuaries and Wetlands

These topics are discussed and impacts analyzed where they occur as habitat for the fish and wildlife species in this section.

(9) Impact on Areas of Special Concern

These areas are all habitats for fish and wildlife species and impacts are discussed as they occur in the planning area.

(10) Impact on Marine Sanctuaries

There are no marine sanctuaries in the Alaska OCS Region.

(11) Impact on Employment and Demographic Conditions

Peak employment effects would be about 5 times greater than in the proposal. The high case could result in a reduction in joblessness among residents of the region, as compared to a moderate reduction in joblessness resulting from the mean case. For the region as a whole moderate effects would be expected.

(12) Impact on Land Use

Effects from the high case could be approximately 5 times the levels discussed in the proposal. Therefore, the effects would be low in Unalaska, Cold Bay and high in St. Paul.

(13) Impact on Commercial Fisheries

Development of high case resources could produce effects slightly greater than those discussed in the proposal. Space-use conflicts would be greater by the increased number of exploratory platforms and development platforms. However, these effects would only slightly increase the potential for any resultant commercial fishing harvest loss from that of the proposal. The level of exploration- and supply-vessel traffic could also be greater and, therefore, could increase the potential for interaction with fixed-fishing gear. However, this increase would not be significantly greater. The discovery of 640 MMbbls could result in construction of a pipeline to the Alaska Peninsula, thereby increasing the loss of fishing area for groundfish fishermen who chose not to trawl over pipelines. The resultant loss in harvest would be low. Damage or loss of trawl gear from the increase in bottom obstruction and debris would be greater than the proposal, but would remain at less than one incident per year. The production of 640 MMbbls would also increase oil spill risks and the likelihood and amount of fixed-gear (crab buoys) contact. The number of buoys contacted in any spill event, however, would be low relative to the total number of pots in use. Overall, the effects on the commercial fishing industry would be very low.

(14) Impact on Recreation and Tourism

Recreational use of coastal areas adjacent to the St. George Planning Area is extremely limited due to the region's scant population and distance from major population centers. Oil and gas development in the St. George Basin would increase the population of Unalaska and St. Paul as a result of support base activities. However, these small population increases would have little effect on regional recreational use.

The two oil spills of 1,000 barrels or greater that are expected to result from oil and gas development could effect recreational uses if they contacted coastal areas of the Pribilof and Aleutian Islands. However, such a spill would have a short-term, low effect since recreational use is light and oil spill clean-up activities are expected to remove any traces of oil in recreational areas.

Impact on recreation and tourism would be low.

(15) Impact on Archaeological Resources

Under the high case, there would be an increased likelihood of effects on archaeological resources due to increases in population as well as the number of wells drilled, such that significant effect would be likely. The effects onshore and offshore would increase but would still be classified as low.

(16) Impact on Transportation Systems

Under this case, effects on the transportation systems of the subject areas would be substantially greater than those forecast for the proposal. A near 5 time increase of production wells and resources, as well as in platforms would result in expanded logistics and tankerage requirements. Impact would be moderate.

(17) Impact on Sociocultural Systems

A larger labor force is associated with the high case, but the locations of facilities to support the needs of offshore operations essentially are the same as for the proposal, only the facilities are larger. Potential effects on sociocultural systems in the Pribilof Islands should continue to be moderate, but with increased levels of contradiction and stress within the social and political structure of the communities over growth management issues. Potential effects on sociocultural systems at Unalaska and Cold Bay could increase somewhat over the levels established for the proposal, but not enough to change the level of impact (very low).

(18) Impact on Subsistence-Use Patterns

A larger labor force is associated with the high case, but the locations of facilities to support the needs of offshore operations essentially are the same as for the proposal, only the facilities are larger. There should continue to be the potential for high effects on subsistence-use patterns on the Pribilof Islands. In Unalaska and Cold Bay, potential effects on subsistence-use patterns may increase somewhat over the levels established for the proposal, but not enough to change the low effects in Unalaska and Cold Bay.

(19) Impact on Military Uses

This is not a subject discussed in the Alaska OCS Region as there are no restricted areas.

f. Impacts of Alternative II - Subarea Deferrals

This alternative evaluates the deferral from leasing in the 5-year program of 13 additional subareas (14 subareas are deferred under Alternative I - the proposed action). One of these additional subareas is in the St. George Planning Area.

Unimak Pass

This option would defer from leasing about 162 whole or partial blocks from the area available for leasing (See fig. II--). A contiguous subarea of about 48 blocks in the North Aleutian Planning Area is also considered for deferral under this alternative. This description and analysis of impacts covers both of these contiguous areas. The deferral area consists of all unleased blocks 3 to 30 miles north of Unimak Pass. In the Unimak Pass area the Tertiary sequence reaches a total thickness of more than 20,000 feet beneath the Bering Canyon and more than 10,000 feet in Amak Basin, but thins considerably as it laps onto the flank of the northwest-trending Aleutian ridge. Potential traps underlying the shelf include anticlines, fault traps, stratigraphic onlap of Tertiary sediment onto basement highs, and sub-unconformity truncations within the basement complex. Potential traps beneath the Bering Canyon include stratigraphic pinchout of turbidite sands, rare fault-bounded traps and possible low-relief diapirs. The overall resource potential of the deferral area is moderate relative to the overall North Aleutian and St. George Planning Areas.

Air and water quality is considered to be pristine throughout the planning area. Pollock, halibut, and other groundfish (including eggs and larvae) spawn in the area. The eggs-larvae of one or more species may be in the upper water layers for much of the year. Adults and the demersal eggs/larvae of other groundfish species (yellow fin sole, Greenland turbot, Pacific cod) occupy water levels near the bottom.

Herring, capeline, smelt, and sand lance are food for salmon, other finfishes, and the marine mammals and birds of the eastern Bering Sea. In the ST. George Basin Planning Area, herring are regaining commercial importance after several decades without a fishery. Herring annually migrate inshore for spawning in the spring and to offshore overwintering waters in the fall. Both immatures and adults probably occur in coastal waters from late spring through early fall. Spawning areas near the proposed Unimak Pass deferral area have not been identified; however, Japanese data indicate that migration occurs through the deferral area during spring, and there apparantly is an offshore movement in the fall.

All American species of Pacific salmon transit waters of this Unimak Pass subarea--as adults returning to Alaska streams to spawn, and as immatures enroute to the north Pacific Ocean to rear. These migrations are seasonal, annually ranging from early May through the end of September or perhaps later. As analyzed for the proposal, these migrations might be temporarily blocked or diverted by contact with oiled waters, with possible mortality and sublethal effects. The salmon food supply also might be reduced. Immature and adult salmon tend to migrate in schools that are relatively close to the surface; thus, the fish could be subject to contact by oil spills. Salmon also frequently orient their migration routes toward coastlines and off headlands.

Red and blue king crab, tanner crab, hair crab, pandalid shrimp, and several clam species are the principal shellfish and mollusks in the deferral area. Portions of the deferral area are major spawning habitat for the red king crab, C. opilio tanner crab, and other shellfish and mollusks.

High bird densities occur in Unimak Pass. In particular, shearwaters forage here in summer and large numbers move between the northern Pacific Ocean and the Bering Sea. Flocks of over 1 million individuals have been observed in the pass in July and August, and movements in excess of 25,000 birds/hour for extended periods have been recorded in April and May. Other species are especially abundant in migration. For example, in late March, April, and May, murres move through the pass typically at about 500 birds/hour with as many as 12,000/hour recorded. Mean density of all species in Unimak Pass in summer, including fulmars, storm petrels, gulls, and murres and other alcids, is 224 birds/km2, or about 720,000 birds at any given moment.

Northern fur seal, harbor seal, Stellar sea lion and sea otter migrate through and/or spend foraging time in this deferral area. A majority of the gray whale population (13,000-15,000) passes through Unimak Pass during spring and fall migrations each year. Gray whales may be in Unimak Pass from late March through June and from May and late November to early December. Bowhead and right whales visit the St. George Basin very infrequently (bowheads in late winter to early spring and right whales in summer). There have not been any sightings of either species in this subarea. Sei and blue whales are generally present during the summer months although not with any regularity, since their preferred summer feeding habitats are south of the St. George Basin. Fin whales are more frequently observed in this area than either the blue or sei whales, especially during the summer. A small local population of humpback whales may summer in the waters around Unalaska Island, a portion of which would be included in this deferral. Sperm whales prefer deeper, oceanic waters, and generally would spend only a minimal amount of time in the deferral area, while migrating to and from summer feeding areas.

The Unimak Pass deferrral would defer leasing in a number of blocks in which there is a significant amount of fishing for C. bairdi tanner crab.

Deferral of this subarea slightly reduces the probability of oil spill contacts to any of the finfish resources within the deferral area. Deferral of blocks north of Unimak Pass would decrease the risk of oil spills occurring within the deferred blocks and contacting large numbers of adult salmon migrating to the Bristol Bay region spawning streams from the North Pacific and Gulf of Alaska, and by juvenile salmon migrating in the opposite direction. This represents only a small decrease in risk, primarily from platform spills, as tanker traffic through the pass would still occur with its inherent risk of oil spills. Deferral of these blocks north of Unimak Pass would decrease oil spill risks to a major portion of the red king crab and C. opilio tanner crab spawning habitat. However, given the broad distribution and large abundance of these species groups (shellfish and mollusks), and the relatively small areal extent of even a large spill (1,000 barrels or greater), the effects on these species from oil spills would be minimal.

By eliminating potential platform spill sites north of Unimak Pass, this deferral provides additional time for any spills to undergo weathering and cleanup before approaching the pass. Any spills approaching or occurring in Unimak Pass in the spring, summer, or fall could result in moderate effects. The potential for major impacts to marine and coastal birds exists if a spill occurred during a period of concentrated bird use of the pass. This alternatiave could slightly reduce oil spill effects on marine mammals along the shelf-break habitat north of Unimak Pass, but would not provide much protection from noise disturbance to migrating whales, which pass through Unimak Pass. Aircraft and vessel traffic would have similar levels of noise. The risks from oil spills would be slightly reduced; most risk would be from tankering through the pass. The deferral of blocks north of Unimak Pass would not change the level of oil industry activity elsewhere in the planning area. The potential for slight losses of fish harvest through placement of platforms would be eliminated from this area.

g. Impacts of Alternative III - Add a Sale in the Straits of Florida

Adding a sale in the Straits of Florida will not effect this planning area. However, under Alternative III all sales proposed in Alternative I - the proposal, would be held. Therefore, the expected impacts of Alternative III are identical to Alternative I for this planning area.

h. Impacts of Alternative IV Biennial Leasing

This alternative increases oil reserves from 135MM bbl of oil in the proposal to 270MM bbl and gas reserves from 1261 BCF to 2522 BCF. The number of platforms is expected to increase from one in the proposal to two with exploration wells increasing from 11 to 22 and development and production wells increasing from 35 to 70. The number of sales increases from one to two.

This alternative projects a second sale within the St. George Basin Planning Area and a 100 percent increase in resource level and development infrastructure. Although resource levels and development infrastructure double, the effects of this alternative on all resource categories would be the same as those indicated for the proposal (Alternative I) for the following reasons:

1. The number of oil spills of 1,000 barrels or greater would be assumed to be 1 for both alternatives.
2. The amount of drilling fluids, drill cutting and formation waters discharged into ocean environment would double with Alternative IV. Approximately 1.04 million barrels of drilling muds, 1.46 million barrels of drill cuttings and 3,000 MMbbls of formation waters would be discharged from two platforms. Although total discharges would double over Alternative I levels, only .26 square kilometers of the planning area would be impaired.
3. Shore-based facilities under both alternatives would be in the same locations (Pribilof Islands, Unalaska, and Cold Bay) and be of comparable size.
4. Although the number of wells and platforms under Alternative IV would double, the amount of noise and disturbance would double but this would not be a substantial increase over existing levels.
5. Manpower requirements would not double in Alternative IV due to the relatively fixed labor requirements entailed in the construction of a terminal/processing facility.

i. Impact of Alternative V - Acceleration Provision

Alternative V (Acceleration Provision) would accelerate the sale schedule outlined for Alternative I by over a year. However, the accelerated schedule would not shorten the current presale process.

Under Alternative V, the resource estimates (135 MMbbls of oil and 1261 BCF of gas) and development assumptions would be identical to those for Alternative I. Because these assumptions are identical, the effects of Alternative V on all resource categories would be the same as Alternative I except that they would be accelerated by one year.

(j) Impacts of Alternative VI - Defer Leasing in Six Planning Areas: North Atlantic, Washington and Oregon, Northern California, Central California, Southern California, and North Aleutian Basin

The impacts resulting from this alternative would be the same as described for Alternative I (the proposal) for this planning area.

(k) Impacts of Alternative VII - No Action

Under this alternative, the Secretary of the Interior would propose not to schedule any oil and gas lease sales for this proposed 5-year program. All potential impacts from OCS oil and gas activities to the physical, biological, and socioeconomic environment resulting from hydrocarbon exploration, development, and production would be eliminated.

Oil and gas are currently the nation's primary energy source. Even with a vigorous conservation program the United States' demand for energy will continue to grow. With the adoption of Alternative VII, the oil and gas that would have been available as a result of this proposed program would no longer contribute to the national domestic production during the life of the program.

With the removal of the potential oil and gas into the national energy reserves, it would necessitate the increased production of energy from other conventional and non-conventional energy sources (see Appendix C), and/or increases in import levels from foreign sources. Impacts resulting from the develoment of the alternative energy sources are summarized in Section II.A.7 and discussed in Appendix C.

17. Navarin Basin

a. Alternative I

The proposal includes the holding of 2 sales in the Navarin Basin planning area. It is estimated that the sale will produce about 1,920 million barrels (MMbbls) of oil and 2,326 billion cubic feet of gas over a 35 year period. These resources will be produced from 229 production wells from 7 platforms. In addition to the oil and gas, up to 150 MMbbls of formation water could be produced. Approximately 485 thousand barrels of drilling muds and fluids and 1,200 thousand barrels of drill cuttings could be discharged into the sea over the life of the proposal. About 82 exploration wells will be drilled. It is anticipated that 1 support base will be expanded and that at least 1 onshore facility will be expanded and/or developed.

(1) Interrelationship of Proposal with other Projects and Proposals

Section IV.B.11.a.(1) presents a discussion of the interrelationships of the proposal with other projects and proposals for all Alaskan planning areas.

(2) Projects Considered in Cumulative Impact Assessment

Section IV.B.15.a.(2) presents a discussion of the projects considered in the cumulative impact assessment for this planning area.

(3) Physical Environment

(a) Impact on water quality

In the Navarin Basin, the anchoring of seven exploration or production platforms and entrenchment of pipelines would increase turbidity only temporarily over a limited area. Discharges of drilling fluids (485,000 bbls of drilling muds and up to 150 MMbbls of formation waters) during exploration and production would contaminate less than 1 square kilometer of ocean. Production but not exploratory discharge would continue intermittently over several years. The six expected oil spills of 1,000 barrels or greater could significantly, but temporarily, increase water-column hydrocarbon concentrations over several hundred kilometers. See Section IV.B.11.a.(3) for generic impact discussion.

CONCLUSION: Effects on water quality from the proposal would be low.

CUMULATIVE IMPACTS: Cumulative effects include those from the proposal plus those arising from previous and proposed lease sales. Cumulative risk of oil spills would significantly, but temporarily, degrade water quality in the study area. In the cumulative case 14 oil spills of 1,000 barrels or greater would be expected. Overall, oil pollution would be increased from that for the proposal alone, but no other effects on water quality would be greater than for the proposal due to the timing of the particular sales, their production/construction schedules, and the duration of anticipated effects. Significant long-term effects on regional water quality would still be very unlikely. Low water quality effects would occur through short- and long-term local degradation.

CONCLUSION: Low water quality effects would occur through short- and long-term local degradation.

(b) Impact on air quality

In the Navarin Basin, effects on air quality from the proposal are expected to be very low, based on projected emissions of offshore exploration and production activities and no onshore facilities in an area of pristine air quality. Projected peak emissions from 7 platforms would not exceed State or Federal air quality limitations unless concentrated nearshore in small areas. No land falls within five miles and on a common boundary, therefore emissions are not expected to exceed State or Federal limitations. Section IV.B.11.a.(3) discusses individual potential effects.

CONCLUSION: Direct effects on air quality from the activities of the proposal would be very low.

CUMULATIVE IMPACTS: Cumulative effects that could occur would be from the proposal.

CONCLUSION: Cumulative effects of the proposal could be very low.

(4) Biological Environment

(a) Impact on plankton and benthos

Various lifestages of invertebrates inhabit benthic and surficial waters in the planning area. The planktonic larvae of crab species are concentrated in upper levels of the water column (to 60 m) for several months. After metamorphosing to juveniles and settling to the bottom, they move to shallow, nearshore areas.

Due to the rapid dilution expected following discharges and the limited radius of effects, effects on planktonic organisms from discharges of drilling fluids (485,000 bbls), cuttings (1,200,000 bbls), and formation waters (up to 150 MMbbls) from the 229 wells projected over the life of the proposal would be limited as documented in the FEIS for the North Aleutian Basin Sale 92. Discharges from 229 wells would occur in water depths from 30 to 100 meters and, therefore, would be expected to dissipate and dilute rapidly. Under these conditions, lethal effects from such discharges on plankton would be expected only within a few meters of the discharge point.

It is expected that 1,920 bbls of oil will be found in the planning area. It will take 229 production wells on 7 platforms to produce it. Effects from the 6 assumed oil spills of 1,000 barrels or greater on planktonic species also would be limited. Effects would be restricted to the area affected by the spill, which would be relatively small compared to the extensive alternate habitat inhabited by benthic and pelagic lifestages of most species. Furthermore, concentrations in the water column associated with the spill would approach lethal concentrations for plankton only a short distance from the spill site. Beyond this, concentrations would diminish with distance and over time (several days) to concentrations well below those shown to produce effects. Therefore, only a small portion of the regional populations of planktonic organisms in the Bering Sea could be affected.

CONCLUSION: Overall, effects of this proposal on regional populations of planktonic invertebrates are expected to be very low.

CUMULATIVE IMPACTS: Activities that may produce cumulative effects on invertebrates include other Federal and State ongoing, and proposed petroleum development, commercial fishing operations, and other nonpetroleum activities. In the cumulative case, planktonic invertebrate lifestages in the pelagic environment may inhabit areas with increased oil spill risk (14 oil spills of 1,000 barrels or greater would be assumed); however, effects on these regional populations are still expected to be low. Although these offshore, planktonic organisms include crab larvae, and juvenile and adult shrimp, which may be killed by hydrocarbon concentrations below their 0.1 ppm LC50 value, they are widely distributed during their pelagic existence. Even an oil spill that spread to cover 200 square kilometers would kill or affect only a localized number of these organisms that constitute a portion of a regional population.

CONCLUSION: In the cumulative case, plankton are not expected to experience greater than very low effects.

(b) Impact on fish resources

The Navarin Basin Planning Area encompasses a portion of the Bering Sea noted principally for commercial groundfish resources, with additional limited harvests of crab. The 200 meter isobath roughly bisects the Navarin Basin Planning Area on a diagonal; the shelf and slope above 200 meters comprise the areas of greatest fisheries resource abundance. There is a considerable body of published information concerning the effects of petroleum hydrocarbons in the marine environment.

Following an oil spill, a number of physical and chemical properties affect the hydrocarbon exposure and ability of a fish to respond effectively to the pollutant. These include the size, shape, and duration of the spill as well as the amount of oil incorporated into the water column and bottom sediments.

A species' vulnerability is determined not only by the physical and chemical processes affecting the oil by time, size, and location of the spill, but other factors as well. Most fish and many of the shellfish present in the southeastern Bering Sea undergo seasonal migrations. Additionally, the amount of natural or ecological stress on an animal is an important, but poorly understood factor in how it will react behaviorally or physiologically to petroleum in seawater.

It is difficult to quantify a loss as a result of an oil spill. However, as an example, assuming crab larval densities of 500/1000 m3 from the southern Bering Sea (Armstrong, 1981) and a 1,000-barrel oil spill covering 10 sq.km. days approximately 5,000 larvae could be affected. Assuming a natural larval mortality of 90-percent, 500 adult crabs could be lost from the population within a decade after the spill. This represents 0.8 percent of the 1982-1983 harvest from the St. Matthew and Pribilof Island areas. Six oil spills of 1,000 barrels or greater are assumed. Therefore, the potential effect of an oil spill on fisheries resources is generally considered very low.

Some seismic energy sources have potential for damage to pelagic fish that are in very close proximation to the source. The energy waves may be disturbing at much greater distances. In the case of migrating salmonids, this disturbance could delay or divert a small number of the fish. For the Navarin Basin area, this potential would be very limited in both time and area. Herring might be similarly affected, however, the groundfish and shellfish of this area should not be affected by these surveys. Overall, the effect on pelagic fish of seismic surveys, from airguns, is assessed as very low.

About 530,000 bbls of drilling muds would be discharged from seven platforms. Evidence indicates that lethal concentrations (greater than LC50) of the dissolved fraction of drilling fluid contaminants are only present within a few meters of the discharge pipe and that the apparent effects of drilling mud discharges are most limited.

Groundfish (including halibut), herring, salmon and the blue king crab could be affected by the proposal. The walleye pollock would be the groundfish most apt to be contacted and affected by an oil spill. Blue king crab larvae in the shallow waters off St. Matthew Island could be reduced by oil reaching these areas during the annual spawning season. Five hundred adult crab could be lost from the population within a decade after the spill. Pollution events could also affect salmon on a seasonal basis.

CONCLUSION: The impact from oil spills, discharges, and seismic survey activities for all species would be low.

CUMULATIVE IMPACTS: Oil and gas development elsewhere in the eastern Bering and Chukchi Seas have the potential for cumulative adverse impacts on the fish resources of the Navarin Basin area (14 platforms are assumed). Also, commercial fishing efforts in the Navarin Basin Planning Area could cause cumulative effects on the fisheries.

Any oil produced from the Navarin Basin or other sale areas within the region probably would be tankered southward through the eastern Bering Sea, Unimak Pass, and the north Pacific Ocean. Open-sea tanker spills are not forecast to appreciably impact on salmon, herring, groundfish, or shellfish because of the vastness of the region, and the rapid dissipation and degradation of the spilled oil. Umiak Pass is a major migratory passage for salmon, other finfish, and marine mammals; hence a tanker accident there could have some impact, albeit minor in extent and degree, if large volumes of oil were to enter these waters during the critical migratory times of these organisms. This would chiefly delay or detour salmon migrations. It is not likely that the more-sensitive larval forms of the fishes would be present in significant concentrations or numbers.

CONCLUSION: Impacts on the groundfish, shellfish, salmonids, or herring would be low.

(c) Impact on marine mammals

Twelve to 13 species of non-endangered marine mammals--Pacific walruses, bearded, spotted, ribbon, and ringed seals, northern fur seals, Steller sea lions, beluga, killer, and minke whales, Dall's porpoise, Bering Sea beaked whales and goosebeaked whales--commonly occur in a portion of or throughout the Navarin Basin Planning Area and are very likely to have some interaction with OCS industrial activities. Oil pollution and disturbance due to increased human activity and habitat alterations could adversely affect marine mammal populations found in the planning area. The general effects of oil spills, noise and disturbance, and habitat alterations on marine mammals are discussed in Section IV.B.11.a.(4) Impact on Marine Mammals in the Gulf of Alaska Planning Area.

An estimated 225,000 or 90% of the Pacific walrus population and over 250,000 bearded, spotted, and ribbon seals occurring in the Navarin Basin during the ice-cover season are the primarily marine mammal populations at risk from the 6 assumed oil spills of 1,000 barrels or greater that may be associated with the proposal. If an oil spill contacted the pack ice front during the spring migration of walruses, seals, and beluga whales, large numbers of marine mammals may be exposed to oil contamination. A few hundred to perhaps 10,000 female walruses and calves could be contaminated. If the oil spill spread and moved over several kilometers as discontinuous patches of oil within broken ice, perhaps an estimated 100 bearded seals could be contaminated along open-water leads; and a small number of spotted and ribbon seals may be affected. The oil contamination of the above number of walruses and seals could result in the possible death of a few hundred to a few thousand walrus calves due to physiological stress and/or the death of no more than perhaps 50 young seal pups at the most through the loss of thermal insulation from oil contact. These losses would represent a low impact on regional walrus and bearded seal populations and probably very low effects on spotted and ribbon seals. A few herds of walruses numbering a few hundred to a few thousand may encounter patches of oil on the leeward side of ice leads if an oil spill contacts these habitat areas. Some animals may become heavily contaminated with oil; it is possible that heavily oil-coated young calves could die as a result.

Groups of whales and dolphins numbering perhaps 10 to a few hundred could surface in oil-contaminated ice leads, and some of these animals could actually contact oil on the surface or in an oil-water emulsion layer covering part of the leads. This brief exposure is likely to have very temporary irritation effects on cetaceans. Most of the oil that contacts the whale's skin is likely to be washed away when the animal dives. Any oil that might adhere to the whale also would be subject to weathering. The most toxic and most harmful hydrocarbons in the oil spill also would be rapidly dispersed by wave and wind action, which could greatly reduce the time of exposure. No cetaceans are likely to die from the probable brief exposure to an oil spill. If exposure of the whales to a spill were prolonged due to severe ice conditions that prevent the whales from moving out of a contaminated lead system, oil contact and inhalation of toxic hydrocarbon fumes could possibly contribute to the death of very weak or diseased individuals through increase in physiological stress. However, oil to which the whales are exposed also would be evaporating and dispersing, thus limiting the degree of exposure. Even in a situation with whales trapped in a contaminated lead, the number of whales severely affected is likely to be very low in comparison to a population's annual recruitment.

Thus, direct oil spill effects on nonendangered marine mammals are likely to be low.

Although the 6 assumed oil spills of 1,000 barrels or greater associated with the proposal could have direct effects on some marine mammal food organisms within very local areas near the spill sites, marine mammals in the Navarin Basin are opportunistic feeders. They exhibit highly mobile foraging habits and can easily shift from affected local food organisms to unaffected prey and unaffected habitat areas. Even a 100,000 barrel oil spill would not kill sufficient numbers of prey organisms used by marine mammals to measurably reduce the overall food sources of any marine mammal species' population above the natural variability in prey populations. Any local reduction in pelagic prey organisms due to any oil spill is likely to be restored by rapid recruitment after the spill has been dispersed. Thus, indirect effects of oil spills on marine mammals are likely to be low to very low.

Traffic from the helicopters and supply vessels assumed to be associated with exploration and development--as well as seismic boats-would be primary sources of noise and disturbance of marine mammals. The most serious disturbance could come from aircraft flights over walrus nursery herds hauled out on the ice during spring migration. Such disturbance could cause physical injury and death to walrus calves by panic-stricken walrus cows. Disturbance also may cause abandonment of walrus calves by the cows. However, the number of nursery herds of walruses disturbed by aircraft flights are likely to be few. Seals and beluga whales may be displaced along aircraft or vessel routes--probably with low effects on the regional populations. Oil-tanker trips and LNG-tanker trips to and from the Navarin Basin each year during oil production may temporarily interrupt the movements of beluga whales, seals, and walruses when the vessels pass nearby. However, this level of vessel traffic is unlikely to block or greatly delay marine mammal migrations through the Navarin Basin severe ice conditions are likely to have a far greater influence on marine mammal spring and fall migration patterns than vessel traffic associated with the leasing proposal. Tanker traffic is very likely to have no more than low effects on marine mammal migration patterns. Overall noise and disturbance effects on marine mammals are not likely to exceed low. Dredging, drill platform construction (seven production platforms), and oil and gas pipelaying, and burial could temporarily displace marine mammals and some food sources near these sites during construction activities. Some marine mammals could continue to be disturbed, and perhaps migration movements and habitat use could continue to be diverted a few kilometers away from the seven production platforms. However, this displacement is likely to be very small in comparison to the natural variability in habitat use and variability in migration patterns. Thus, noise and disturbance, and habitat alterations associated with dredging, and with platform construction and operations--are likely to have low impacts. The tanker terminal facilities assumed to be built offshore could temporarily disturb and perhaps displace a small number of ice seals that seasonally inhabit sea ice near the site. However, this displacement would have no more than a very low effect on the local seals.

CONCLUSION: The effects on non-endangered marine mammals of oil spills, noise and disturbance, and adverse habitat changes associated with the proposal are likely to be low.

CUMULATIVE IMPACTS: The additive effects of other ongoing and placed projects, as well as the proposal on nonendangered marine mammals are discussed in this section. Although the probability of any or all planned and ongoing projects reaching developmental stages is generally unknown, this analysis assumes that all the following projects do reach development stages. These projects could affect marine mammals by oil spills, noise and disturbance, and by habitat alteration.

Projects that could have cumulative effects on marine mammals occurring in the Navarin Basin include possible oil and gas tankering from OCS leases in Norton Basin, and Chukchi Sea; Canadian oil tankering through the Bering, increases in other commercial marine and air traffic, and increases in commerical fishing particularity the bottom fisheries. Cumulative increases in vessel traffic in the central Bering-Navarin Basin may result in more ship accidents and result in hydrocarbon spills into the marine environment. However, oil spills are not likely to have very serious population level effects on the marine mammals occurring in the Navarin Basin with the exception of fur seals. Ribbon, bearded, spotted, and ringed seals are present in small or single-animal groups distributed along the ice front. Thus, oil spills are not likely to affect a large number of these ice seals. Furthermore walrus and adult ice seals are not likely to suffer lethal effects from oil spill contact. Although fur seals are present in the southern part of the planning area during the summer, these seals are widely distributed over their foraging habitat offshore in small groups or as single animals. Thus, a few hundred seals at the most are likely to come in contact with an oil spill which would become highly weathered, dispersed, and evaporated within 10 days after its release. Cumulative oil spill effects (14 spills of 1,000 barrels or greater would be assumed) in the Navarin Basin on marine mammals are likely to be low. Noise and disturbance associated with increases in marine traffic, and increases in aircraft associated with cumulative oil development, and increases in the human population would result in the temporary and perhaps long-term displacement of marine mammals particularly and sea lions from haulout sites on St. Matthew and Hall Islands that maybe adjacent to air- and/or vessel-traffic routes. If the air and/or vessel traffic is frequent enough to cause long-term or permanent displacement of a portion of a species regional population to a less favorable habitat (haulout-sites), impacts could be moderate to very high if a species population was reduced and the recovery to its former level took 10 years or more (very high impacts). However, pinnipeds, and other marine mammal populations may habituate to cumulative sources of noise and disturbance after perhaps a few years such that these effects are likely to be no more than moderate. Marine mammals also could be incrementally affected by changes in abundance and distribution of prey species due to commercial fishing in the Bering Sea and Navarin Basin, particularly if bottom fisheries are established in Alaska. Pinnipeds and other species populations may suffer cumulative population declines associated with the loss of high numbers of animals entrapped in discarded fishing gear or losses from active gill net fisheries.

Oil spills associated with cumulative OCS activities and other marine traffic, and noise and disturbance resulting in long term or temporary displacement of marine mammals, changes in abundance of prey that may be associated with primarily commercial fishing, and other population losses due to discarded fishing gear or losses from gill nets could have moderate cumulative effects on one or more marine mammal species population.

CONCLUSION: Cumulative effects of the proposal and other developments are likely to have moderate effects on marine mammals.

(d) Impact on coastal and marine birds

Important regional seabird populations in the vicinity of St. Matthew and adjacent islands are likely to sustain high losses if the 6 assumed spills of 1,000 barrels or greater occur when birds are present during the breeding season. Regional effects on overwintering marine birds in this area are likely to be low.

Disturbance of seabird nesting areas near proposed support facilities on St. Paul Island may cause some colonies to be abandoned resulting in moderate declines of regional seabird populations for the duration of operations.

Seabirds and waterfowl overwintering in the Bering Sea area may sustain losses, but effects on regional Bering Sea populations should be low. In late spring, effects could be more pronounced on migrant birds but regionally still are likely to be low. During the open-water season, oil spill effects are likely to be low or very low.

Oil spills occurring in the Unimak Pass area and south of the Alaska Peninsula during the breeding season or during migration may produce moderate effects in seabird populations. The large concentrations of shearwaters that frequent this area could experience high oil spill effects. Substantial contact of overwintering waterfowl could result in moderate effects in some species. Chronic presence of hydrocarbons in the environment, sustained disturbance, and indirect factors, could have a substantial impact upon seabird breeding success in this area. High effects of OCS activities in the Navarin Basin are most likely to occur on and in the vicinity of either St. Matthew or St. Paul Island depending on the final selection of the support base.

CONCLUSION: Only low effects are likely to be experienced by bird populations occurring within the Navarin Basin area as a result of OCS activities.

CUMULATIVE IMPACTS: As transport of petroleum from Arctic and Bering Sea planning areas increases, the potential for high effects due to tanker traffic on the large numbers of seabirds in the Unimak Pass and Pribilof Island areas will escalate. This is particularly true during migration and breeding periods when hundreds of thousands of breeding individuals are present and flocks in excess of one million shearwaters have been observed. However, substantial risk may exist for overwintering and migratory populations as well.

Other factors that may contribute to cumulative effects include mortality resulting from birds accidentally captured in salmon driftnets, the long-term effects of habitat degradation, disturbance, and possible alteration or reduction of prey-species populations.

Disturbance during construction of support facilities may cause some marine birds to be displaced from their nest sites. Increased vessel and aircraft traffic and habitat degradation could result in some long-term decline in numbers of nesting birds. The overall effects of these activities are expected to be low.

Reduction in prey availability may have extremely adverse effects, as illustrated by the 1982 nesting season when lack of suitable prey species at St. Matthew Island was the most likely cause of the nearly total reproductive failure by several species of seabirds. The cause of prey-species decline in this area is unknown but may be linked to increased commercial fishing effort in the Bering Sea region. In combination with other adverse effects over longer periods, such failures could result in high impacts to regional seabird populations.

While many seabirds do not undertake extensive migrations, some do migrate through or overwinter in or near other planning areas and therefore are subject to an increased oil-spill risk. Most waterfowl and shorebirds are highly migratory and thus likely to migrate through, overwinter in, or breed near other State or Federal areas. Spills and/or disturbance that adversely affect breeding stocks of certain seabird species at more than one major colony could result in a significant reduction of their regional populations. Additionally, where major populations are coincident with a high cumulative risk of oil spill contact, such as in the Pribilof Islands or, potentially, Unimak Pass and the adjacent eastern Aleutians, high effects could be experienced.

CONCLUSION: Cumulative effects on regional marine bird populations would

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be low in the vicinity of the planning area; however, high effects could occur in the Pribilof Islands, and Unimak Pass.

(e) Impact on Endangered and Threatened Species

Five endangered whales utilize habitats within or adjacent to the planning area. Bowheads are present during the overwintering period; gray, right, humpback and sperm during the spring through fall, and fin whales all year. The only endangered bird species likely to be present in the area is the short-tailed albatross. There are no listed plant species in areas adjacent to the planning area. Refer to Section IV.B.11.a.(4) in this document for details on effects to endangered species that may occur as a result of oil and gas activities associated with the proposal.

A formal Section 7 Endangered Species Consultation of MMS with NMFS and the FWS was conducted for the proposed sale 83 for the Navarin Basin Planning Area. The biological opinion from the FWS was dated 09/16/80 and covered the American and Arctic peregrine falcons, short-tailed Albatross, Aleutian Canada goose, and Eskimo curlew. The biological opinion from NMFS is dated 03/01/85 and covered the potential effects of exploration activities on endangered whales. See Chapter V for a further description of the consultation process for Section 7 of the Endangered Species Act of 1973.

Six oil spills of 1,000 barrels or greater are assumed to occur during the life of the proposal. Oil would be loaded offshore onto icebreaking tankers to be shipped to Balboa Bay and then to market. The tanker route to Balboa Bay will pass through Unimak Pass. Oil spilled in the winter could be incorporated into the ice, remain in relatively unchanged form, and be released during spring meltdown. Spilled oil present in the spring and summer could result in massive zooplankton deaths limiting the food supply of the whales.

Although icebreakers are fairly noisy, sound levels above ambient levels may not persist during breakup and freezeup. However, movement of these tankers through open water or young ice may result in noise levels causing avoidance reactions in whales. Since a land support base will not be in the immediate vicinity of the planning area, noise associated with these activities is not expected to ensonify large areas of the planning area.

The planning area is important as an overwintering area for bowheads. They seem to prefer areas along the ice front, the polynya south of St. Matthew Island and areas of concentrated but weak ice. Noise disturbance or spilled oil that displaces them from their preferred overwinter habitat will use more blubber fat than if no disturbance occurs. Lowered blubber stores may result in hardships for pregnant females or young of the year calves experiencing their first winter. Fin whales are present year round and would also be exposed to the same effects as bowhead whales. Gray, sperm and humpback whales are present during the summer and fall months. The increase in activities during the open water period will affect these whales the most.

CONCLUSION: Effects of the proposal on gray, fin, sperm, right and humpback are expected to be low. Effects on bowheads are expected to be moderate. Effects to the short-tailed albatross are expected to be very low.

CUMULATIVE IMPACTS: Cumulative effects include increased exposure to oil spills (14 oil spills of 1,000 barrels or greater would be assumed), transportating oil tankers and support traffic. If previous experience to these types of noises in other planning areas result in avoidance reactions, abandonment or displacement of whales in the Navarin Basin Planning Area is possible. A reduction in fecundity is an expression of long term physiological response to physical effects. Exposure to disturbance factors during overwintering periods or summer feeding periods may be more detrimental to a species' survival than disturbances encountered during the migration periods. Because short-tailed albatross are infrequent visitors of the Navarin Basin Planning Area, cumulative OCS development, as projected, would have very little effect on this species.

CONCLUSION: Effects to bowheads are expected to be moderate and not exceed moderate for gray, fin, right, sperm or humpback whales. Cumulative effects to the short-tailed albatross would be very low.

(f) Impact on estuaries and wetlands

These topics are discussed and impacts analyzed where they occur as habitat for the fish and wildlife species in (4)(a) through (4)(f) in this section.

(g) Impact on areas of special concern

These areas are all habitat for the fish and wildlife species in (4)(a) through (4)(f) and impacts are discussed as they occur in the planning areas.

(h) Impact on Marine Sanctuaries

There are no marine sanctuaries in the Alaska OCS Region.

(5) Socioeconomic Environment

(a) Impact on employment and demographic conditions

The search for and discovery of oil and gas within the Navarin Basin Planning Area could create employment opportunities and consequently increase population levels. These changes have both positive and negative attributes, thereby giving an indication of the socioeconomic well being of communities of the State or regions within the State.

This proposal could generate a region wide total of up to 4,000 jobs during peak activity. This is based on estimates made in past EIS's for the Alaska OCS Region for similar activities in similar areas. The bulk of the jobs (perhaps 90+%) will be filled by workers living in enclaves near the job site.

The general pattern is one of small employment effects in the exploration phase and fairly large effects during the development phase with most jobs in both the exploration and development phases filled by commuters living in the petroleum industry enclave. By contrast, it is expected that the moderate number of new jobs created during the production phase could be filled somewhat by permanent residents of a community.

A State-wide peak population increase of about 325 persons could be associated with the projected employment increase. Of that number a small proportion may live in a small town or village associated with development activity. The bulk of the new population (families of enclave living workers) would live in Anchorage, The Matinuska Valley or on the Kenai Peninsula. Impacts are potentially more significant in those areas of small present population near which offshore-related activities may be located.

For the planning area, Unalaska, St. Paul, and Cold Bay are the towns that may be affected. Because of the small number of new jobs and population anticipated impacts are expected to be low on a regional basis. Impacts at any one of the named villages could be moderate during an influx of population depending on timing and duration.

CONCLUSION: The proposal would be expected to have moderate effects on the employment and demographic conditions of Unalaska, St. Paul and Cold Bay.

CUMULATIVE IMPACTS: Cumulative effects of Federal oil and gas developments in the Navarin, St. George, and North Aleutian Planning Areas could substantially increase regional employment and population. OCS development in the latter planning areas would use the Pribilof Islands and the cities of Unalaska and Cold Bay as support lease sites. Regional employment and population increases would be centered in these communities.

CONCLUSION: Cumulative employment and subsequent population growth will be moderate both regionally and at the local level.

(b) Impact on coastal land uses

Most of the land in the region is in National Wildlife refuge status or under the ownership of Native corporations. Due to the small amount of available land in the region, competition between existing uses and onshore development may create land use conflicts primarily in areas indicated as hypothetical air- and marine-support bases. New land uses such as onshore staging areas, temporary construction camps, or supply bases could displace potential uses of areas originally projected for use as commercial, residential, or industrial sites.

The groundfishing industry also is likely to impact OCS-related land uses since boat harbors, warehouse areas, and residential areas are used by both industries. Secondary land-use demands in conjunction with the groundfishing industry could preclude other projected or potential land uses.

The hypothetical siting of petroleum exploration and development infrastructure at St. Paul Island, the cities of Unalaska and Cold Bay would pose the most problems in terms of conflicts with other use demands. Those effects would be similar to those already discussed for these communities, in the effects sections dealing with the North Aleutian and St. George Basin. However, oil that may be produced as a result of the proposed action would be loaded offshore while produced gas would be pipelined to St. Paul Island. This scenario would have the affect of somewhat reducing potential land use effects. In regard to St. Matthew Island a forward air support facility may in the future be located on it; however, at this point such an eventuality is still a point of legal debate.

CONCLUSION: Effects of the proposed action would be low.

CUMULATIVE IMPACTS: Given that land use will have largely been effected by other planning areas. The proposal will in only a minor way further alter land uses. The exception to this statement should be noted and that is the use or non-use of St. Matthew Island. Should questions regarding its use be resolved so as to allow the establishment of an air support base, the land use status of the Island would drasticaly change and this would constitute a major effect.

CONCLUSION: In general land use effects of the proposal would be low.

(c) Impact on commercial fisheries

In the Navarin Basin Planning Area commercial fisheries are almost wholly foreign fleet operations, with the Japanese predominating. The U.S.S.R., South Korea, Poland, and East and West Germany also fish or have fished in the Eastern Bering Sea and to some extent in the Navarin Basin. Other countries may also enter Bering Sea fisheries. It is envisioned that these foreign fisheries will be replaced by U.S. fishermen. Presently some U.S. fishermen, are engaged in joint-venture fisheries in the Bering Sea wherein the U.S. fishermen catch groundfish that are then sold to foreign processors. There are no U.S. vessels fishing for groundfish in the Navarin Basin area at this time.

Direct impacts on these foreign commercial fisheries from oil and gas development in the area are projected to be low. The planned number of production platforms (7) should not unduly restrict the fishing area nor should fishing be affected by supply or other vessels associated with oil and gas operations. The U.S. Fishermen's Contingency Fund specifies that a claim for fishing gear lost within one quarter mile (0.4 km) of an OCS oil and gas structure shall be invalidated, therefore it would seem feasible to establish this as the buffer zone around each structure which would preclude fishing operations. With a different anchoring system, a production platform would exclude the fishermen from a smaller areas, less than one-half square mile. The results indicate that the catch loss is very low for surface structures because of the relatively small area that is occupied in the year 2007 when domestic fishing activity is projected to be at its peak, the estimated catch loss is 0.26 tons with a value of $45 in 1982 dollars (Centaur Associates, Inc. Navarin Basin Commercial Fishing Industry Impact Analysis, 1982). With adequate aids to navigation and technological improvement this increased vessel traffic will not constitute a significant impact. Much of this vessel traffic increase would occur during field exploration and development, with some reduction expected during the production stages of the field.

Outside the Navarin Basin, oil spills as a result of tankering could adversely affect the marine resources in the vicinity of such loss. Dependent on season, an oil spill of 1,000 barrels or greater would impact largely on the early pelagic life forms of walleye pollock and red king crab. An oil spill could also interact with both salmon adult and smolt migrations to an inconsequential degree.

During exploration, support vessels based at Dutch Harbor would increase boat traffic to the Navarin area. However, this vessel increment to the large existing fishing fleet would constitute a very small fraction of the total vessel traffic. Additionally, from past experience, vessel traffic related to exploratory activities would have little effect on commercial fishing activities. Further, seismic survey could conflict with both trawls and fixed gear, including longlines. To alleviate this potential problem, seismic surveys could be conducted during crab closures, trawlers could be identified at a distance sufficient to avoid contact, and seismic cables could cross longlines at intervals where entanglement would not occur. These impacts would be short-term, low, and largely mitigatable.

Adverse impacts attributable to the proposal would be: (1) loss or damage to fishing gear, (2) a very small loss of fishing area, (3) competition for labor and materials, (4) competition for space onshore, (5) lost fishing time, and (6) tainting of catch by oil pollution.

Some benefits to both the domestic and foreign fishery could accrue from oil and gas development in the Navarin Basin. Among these are aid to distressed fishing vessels, oil industry collection and transmission of maritime weather information to the fishermen, and improved regional transportation.

During oil and gas development in the Navarin Basin, it is likely that any impacts on the Bering Sea commercial fisheries would occur distant from the proposal--principally through an oil spill reaching these fishing areas. This would be limited to loss of gear and catch due to contact with oil spills.

Foreign fishing vessels operating in the Navarin Basin are not likely to sustain loss or damage to either gear or catch from oil spills. Conceivably, trawls could be damaged by passage through oil during deployment or recovery, but this is a very remote probability.

Production areas, including anchorage and the navigation safety zone around platforms, average about 800 hectares, or 2,000 acres. Trawlers would be the most affected. American trawling vessels are expected to fish in this area after 1990. Compared with the total available fishing area, this lost fishing area is very low.

There may be some competition for labor and materials at Dutch Harbor but because of high unemployment probably none would occur in the Pribilof Islands unless their commercial fisheries increase dramatically during the next decade. Oil and related industries probably will compete for labor with fish processors, local government employment, or small private business. Should there be a shortage of commonly-used material (fuel supplies), it is likely that the oil industry would have the capability to out-bid other area industries for such material.

Crab and crab gear could be affected by oil--the former if oil-contaminated water is pumped through live-holding tanks aboard the fishing vessel and the latter by oil slick and would not be contaminated by the surface components of the spill. In some instances, oil slicks might be sighted and avoided. This would be an exception, however, and avoidance would be very difficult.

Gillnets and purse seines also could be fouled by oil, although these gear types are now used only at considerable distances from the proposal. The Japanese high seas salmon gillnet fishery is the most likely to be affected. This fishery, however, is very limited in time annually, further reducing probability of impact. U.S. gillnet and purse seine gear could be oil-fouled should an oilspill occur during the transport phase of Navarin oil development.

Damages to fishing gear and catch, including lost fishing time, would be compensable via provisions of the Offshore Oil Pollution Compensation Fund (33 CFR, Parts 135-136). A self-replenishing fund of $100,000 for each OCS area has been established; however, claims are not limited to this amount. Regulations now in effect have reduced the former overly long claim processing time. For details regarding this fund see Alaska OCS Technical Paper No. 4 (Casey, 1981) which is incorporated by reference.

Loss of fishing time due to the proposal's activities include, but are not limited to, oil spills barring access to fishing grounds, time required to replace fouled gear, and gear cleaning time.

To date, onshore construction projects related to offshore oil and gas exploration and development, e.g., the Gulf of Alaska and Lower Cook Inlet, have had low effects on the fishing industry. The construction workforce has largely consisted of transient workers, housed on-site.

Given current employment trends, local residents hired by the oil industry and its related companies could be easily replaced by the fishing industry. These situations are expected to continue.

Navarin area fishing grounds per se would be minimally impacted by oil and gas development under the present conditions of the fishing industry. Fixed gear is not used to any great extent in the Navarin Basin, nor is it anticipated that the crab fishery will expand over much of the Navarin area. However, the presence of structures and vessels related to oil development could limit trawling. Although the immediate area of a structure comprises less than a square mile--a minute percent of the total Navarin area--sea conditions and gear configuration/deployment would increase the size of the restriced area.

Gear loss due to OCS operations is not expected to be a significant factor in the Navarin Basin itself. With probable marine-fairway designation for tanker routing outside the proposal, the gear-loss problem should be solved.

Another aspect of increased fishing costs is that involving fishing vessels colliding with OCS vessel traffic or structures. Presently, most fishing vessel collisions occur in rather restricted areas, i.e., bays and harbors, and the incidence is very low. The small OCS increment should not appreciably change this already low rate, except that tanker traffic could prove hazardous to fishing vessels in some instances, to an indeterminate degree.

Marine seismic surveys affect commercial fishing when the survey vessels snag or entangle fishing gear, causing a loss of gear (mainly crab pots). In areas where crab pots are concentrated, considerable loss to the fishermen could result. To alleviate this problem, industry is advised to coordinate seismic work with the area fishermen. For example with the present very short crab season in the Navarin Basin area, seismic surveys could be scheduled before or after the season. Also, areas where crab pots are concentrated might be avoided.

With the listed operational procedures in place the potential for impact on commercial fishing is assessed very low.

CONCLUSION: The effect of the proposal on the commercial fishing industry would be very low.

CUMULATIVE IMPACTS: Development of fisheries for new species could result in greater numbers of gear/vessel and structure conflicts between the oil and fishing industries. These new developing fisheries also may create as yet unforeseen conflicts.

Seasonal marine transport is projected to increase as population and the related development of northwestern and arctic Alaska increase with concurrent area/pollution problems for the fishing industry. These would not be significant conflicts with the additional activity, the risk of vessel collisions and space use conflict should not increase appreciably.

The foreign and domestic commercial fishing industries would probably experience adverse impacts from implementation of this proposal. Increased competition (both onshore and offshore) for area labor and materials is identfied as an area of conflict between the oil and gas industry, and the fisheries of the Bering Sea. However, this conflict would not be significant. Impacts on the U.S. commercial fishing industry would be insignificant.

CONCLUSION: Cumulative effects on the Navarin Basin fisheries are assessed to be very low.

(d) Impact on recreation and tourism

There is little or no recreation or tourism activity in the Navarin Basin Planning Area. Because of the minimal level of recreational activities, any OCS development in the Navarin Basin would have a very low effect on recreation and tourism.

CONCLUSION: Impacts on recreation and tourism would be very low.

CUMULATIVE IMPACTS: Because recreation and tourism are virtually nonexistent in the Navarin Basin Planning Area, any cumulative OCS activity would have a very low effect on recreation and tourism.

CONCLUSION: The cumulative effects are very low.

(e) Impact on archaeological resources

The Navarin Basin is an area of low probability of offshore archaeological resources. Because of the unlikelyhood of archaeological resources being present in the Navarin Basin, the proposed action (7 production platforms and 82 exploration wells) would have very little effect on archaeological resources.

CONCLUSION: Impacts on archaeological resources are expected to be very low.

CUMULATIVE IMPACTS: Because of the low probability of the presence of archaeological resources in the Navarin Basin, cumulative OCS activities (11 production platforms and 179 exploration wells) would have very little effect on archaeological resources.

CONCLUSION: The cumulative effects would be very low.

(f) Impact on transportation systems

The scenario for the proposal postulates that produced crude oil will be loaded offshore and that natural gas would be pipelined to St. Paul Island. Centers of support would be located at St. Paul (air and marine support), Unalaska (Marine), and Cold Bay (air operations). Some, if not all, of the infrastructure required to support operations in the Navarin Basin may already be in place. The effects of the proposal would be such that existing support facilities, and in the case of the Navarin Basin, gas liquefaction facilities would be expanded to handle the increased volume.

CONCLUSION: The effects of the proposal are expected to be moderate.

CUMULATIVE IMPACTS: The cumulative effects of the proposal would form a signifcant portion of the overall framework of Bering Sea petroleum development. Specifically in terms of tanker traffic the proposal could increase Bering Sea tankering by 10 to 15 percent over the life of the field.

CONCLUSION: Cumulative impacts are expected to be moderate.

(g) Impact on military uses

This is not a subject discussed in the Alaska OCS Region as there are no restricted areas.

(h) Impact on subsistence-use patterns

Six oil spills of 1,000 barrels or greater would be expected. Subsistence-use patterns on the Pribilof Islands would be adversely affected if the fur seal population were subject to an oil spill--the total annual supply of fur seal meat could be reduced by from 50- to 100-percent. This outcome should be the case whether or not there are direct biological effects in terms of abundance or distribution of the fur seal. An oil spill incident could cause the NMFS to terminate or vastly reduce the commercial and/or subsistence fur seal harvest for the length of time necessary to determine the effects on the fur seal population. This length of time could conceivably be for more than one year. This effect would be high.

Subsistence activities of the residents of the Pribilofs would be the ones most likely to be interfered with. The effects would be low because of the sharing of support base activities with Unalaska and Cold Bay (no terminal on St. George).

The effect of increased competition from the enclave air/marine support base population on the Pribilofs would be low due to the character of the harvest and the local control exerted over local resources.

CONCLUSION: Effects on subsistence-use patterns as a result of the proposal would be low.

CUMULATIVE IMPACTS: Increased air and marine traffic in Cold Bay and Unalaska, industry activity in the Pribilofs, and tankering of crude to a major oil terminal on the Alaska Peninsula could increase the threat of disturbance, interference, and oil spills on the subsistence resources (seals) used by the residents of the planning area. The marginal increases in traffic would have low effects on subsistence around Unalaska and very low effects around Cold Bay. High effects on subsistence in the Pribilof Islands could occur.

CONCLUSION: The cumulative effect of oil spills and other industry activities could result in moderate effects on subsistence in the planning area.

(i) Impact on sociocultural systems

Communities to be affected from a transportation standpoint would be in the Aleutian-Pribilof region. Particularly if Navarin, St. George Basin, North Aleutian, and Norton tankering traffic exposes the area to increased number of oil spills. If subsistence resources are affected, Unalaska family and community centered extraction systems could suffer. Bottom-fishing and other fisheries growth could conflict with oil industry space uses if several discoveries and subsequent development occurred in the southern

Bering Sea area. This conflict could carry over into other areas of the sociocultural system.

CONCLUSION: Sociocultural effects are projected to be low.

CUMULATIVE IMPACTS: Cumulative effects would impact Alaska Peninsula transhipment sites if southern Bering Sea oil and gas development were to occur. Cold Bay also could experience increased air traffic if oil related activity in the southern Bering Sea increased.

Unalaska sociocultural systems could experience increased pressure, particularly if Navarin, St. George Basin, North Aleutian and Norton tankering traffic exposes the area to increased number of oil spills (14 are assumed). If subsistence resources area affected, Unalaska family and community centered extraction systems could suffer. Bottom-fishing and other fisheries growth would conflict with oil industry space uses if several discoveries and subsequent development occurred in the southern Bering Sea area.

CONCLUSION: Cumulative effects are estimated to be moderate.

b. Unavoidable Adverse Impacts

Section IV.B.11.b. presents a discussion of the unavoidable adverse impacts of the proposal for all Alaskan planning areas.

c. Relationship Between Short-Term Uses of the Environment and the Maintenance Enhancement of Long-Term Productivity

Section IV.B.11.c. presents a discussion of the relationship between short-term uses of the environment and the maintenance and enhancement of long-term productivity attendant to the proposal for all Alaskan planning areas.

d. Irreversibile and Irretrievable Commitment of Resources

Section IV.B.11.d. presents a discussion of the irreversible and irretrievable commitment of resources attendant to the proposal for all Alaskan planning areas.

e. Impacts of a High Case Scenario

This section provides a discussion of the environmental impacts that could occur in the unlikely event that all unleased, undiscovered, economically recoverable hydrocarbon resources in the Navarin Basin Planning Area are leased and developed as a result of the proposal. The estimated "High Case" hydrocarbon resources for the Navarin Basin Planning Area are: 3,280 million barrels of oil and 4,260 billion cubic feet of gas. These estimates are higher than the "Base Case" for the proposal. However, infrastructure expected to be used to explore and develop these resources includes 134 exploration wells, 394 development wells and 11 platforms. This is not significantly different from the proposal (82 exploration and delineation wells 229 development wells and 7 platforms). It is assumed in the high case that oil and gas would be transported by pipeline to the Pribilof Islands. In addition, ten oil spills of 1,000 barrels or greater would be assumed.

It is important to point out that Navarin does not have existing offshore development. Resource estimates and infrastructure for the high case are the same as the cumulative case. However, the high case assumes that the resource will be developed as a result of the proposed 5-year program, while the cumulative case assumes that leasing and development will extend over the future 5-year program's lease sales.

(1) Impact on Water Quality

One hundred thirty-four exploration wells, 394 production wells and 11 platforms are estimated for the high case. Sediment resuspension is likely to occur as a result of setting anchors for exploratory rigs and driving piles for production platforms. The amount of sediment resuspended from these activities would be very low and restricted to the immediate area around the activity.

Effects on water quality are to be expected only in the immediate vicinity of discharges. Amounts of muds, cuttings, and formation waters discharged into the environment would be about six times higher than the proposal. Assuming a 200 meter radius mixing zone around a drilling structure only 1.5 square kilometers of the planning area would have impaired water quality during production. Thus effects from deliberate discharges would be low.

In addition to permitted and planned discharges, oil spills are likely to occur. Ten oil spills of 1,000 barrels or greater are projected if oil is produced. Regional long-term degradation of water quality below State and Federal standards because of hydrocarbon contamination is very unlikely. Water quality effects from hydrocarbon release should be moderate.

The overall effect on water quality as a result of the high case would be low.

(2) Impact on Air Quality

Impact on air quality would be the same as the proposal, low.

(3) Impact on Plankton and Benthos

Due to the rapid dilution expected following discharges and the limited radius of effects, lethal effects on plankton would only be expected within a few meters from the 11 platforms. Effects from oil spills would be limited to the area affected by the 10 assumed spills, which would be small compared to the extensive alternative habitat inhabited by benthic and pelagic lifestages of most species. As a result, overall effects would be very low.

(4) Impact on Fish Resources

In the high case, effects on fish would increase over those estimated for Alternative I. The most significant impact could be the tanner crab, halibut, cod, and other groundfish around the Pribilof Islands. Nurseries with immature species are also found in these nearshore areas. Any onshore construction could be a disruptive factor and could affect these nearshore areas (pollution, sediment load). A pipeline to the Pribilofs could cross more intensively trawled areas of the Bering Sea. Overall effects would be low.

(5) Impact on Marine Mammals

Because of the large increase in the chance of oil spill occurrence and contact, transport of oil to the Pribilofs would result in a substantially greater risk to marine mammals inhabiting the Pribilofs. The northern fur seal population in particular would be placed at risk by this action and could experience moderate impacts if a spill occurred during the breeding season when hundreds of thousands of females are foraging at sea. In the event of a spill, pups also would be at extreme risk through contamination from the females. Impact on marine mammals would be moderate.

(6) Impact on Marine and Coastal Birds

Transport of oil via a pipeline to the Pribilofs would increase the likelihood of effects to these islands and greatly increase the risk to the 2.8 million seabirds which breed there from April to October. During this period, when hundreds of thousands of birds may be foraging on the water at any time, the potential exists for major effects on regional seabird populations since a majority of these birds have low reproductive rates; recovery from a major incident could require decades. Impact of disturbance probably would increase minimally in the Pribilofs. Seabird populations overwintering in the Pribilofs could experience high impacts, but regional effects are likely to be low.

(7) Impact on Endangered and Threatened Species

Overall impact on endangered species, due to direct and indirect effects of oil spills or disturbance associated with development and transport of extracted oil would be greater than those described for the base case. Since the high case assumes about two times the level of petroleum resources as estimated for the proposal, an increase in oil spill/whale interaction could also be expected. Increased noise and disturbance associated with the highest levels of development could be expected with the high case and could result in more localized changes in distribution and/or density of potentially sensitive endangered whale species. Overall effects on endangered whales would be moderate. Effects on endangered birds would be very low due to their infrequent occurrence in the area.

(8) Impact on Estuaries and Wetlands

These topics are discussed and impacts analyzed where they occur as habitat for the fish and wildlife species in this section.

(9) Impact on Areas of Special Concern

These areas are all habitats for fish and wildlife species and impacts are discussed as they occur in the planning area.

(10) Impact on Marine Sanctuaries

There are no marine sanctuaries in the Alaska OCS Region.

(11) Impact on Employment and Demographics

Because existing and projected levels of unemployment are low in most parts of the Aleutian Islands Census Division, the very large employment increases associated with the high case are expected to have relatively small effects on the total number of jobless persons in the region. However, due to the current shortage of jobs in the small communities of St. Paul and St. George, the high case might provide very significant increases in employment opportunities for residents of those communities. If the annual fur seal harvest is discontinued, the job situation in the Pribilofs could become desperate, thereby increasing the desirability of petroleum-related jobs. The high case is expected to create large percentage increases in employment at Unalaska/Dutch Harbor and at Cold Bay as well as many thousands of jobs offshore or in uninhabited locations onshore. Impacts could be moderate.

(12) Impact on Coastal Land Use

Land uses in Cold Bay, Unalaska and the Pribilof Islands would have been affected by the development of support bases for prior OCS activities in the Navarin Basin and other planning areas. Because support bases have already been developed, the high case scenario would have a low effect on land use in the above areas since very little new land would be necessary to accomodate the proposed activities.

(13) Impact on Commercial Fishing

The principal change from Alternative I would be an increased loss of fishing gear and the increased probability of loss of gear and/or catch through contact with the oil spill. This increase would not be significant, the actual likelihood of effects remains low. Impact on the commercial fishing industry would be very low.

(14) Impact on Recreation and Tourism

There is little or no recreation or tourism activity in the Navarin Basin Planning Area. Because of the minimal level of recreational activities, any OCS development in the Navarin Basin would have a very low effect on recreation and tourism.

(15) Impact on Archaeological Resources

The Navarin Basin is an area of low probability of offshore archaeological resources. Because of the unlikelyhood of archaeological resources being present in the Navarin Basin, the proposed action (7 production platforms and 82 exploration wells) would have a very low effect on archaeological resources.

(16) Impact on Transportation Systems

In the high case, tanker traffic would be increased by about 70 percent over that estimated for the proposal. Although the increase would be large in terms of the proposal, only moderate effects on transportation systems would be expected.

(17) Impact on Sociocultural Systems

Since all other aspects of the high case are comparable to the proposal, impacts on sociocultural systems in Unalaska and Cold Bay are comparable to the proposal. On St. Paul Island, however, there could be major impacts on Aleut sociocultural systems from changes in subsistence values, orientations, and dependencies (as discussed for the maximum case under impacts on subsistence patterns) and changes in the structure of the community itself. In the short-run, changes in community leadership patterns and controlling factions could be expected from the negotiation and arbitration processes involved in siting a terminal on the island. These changes could produce negative effects if the community were not able to maintain reasonable control over change processes. At the extreme, loss of such control could result in creating a non-Aleut majority on the island which would be interested in shaping a community more to their own liking. However, the high degree of awareness on the island for maintaining control over change--combined with their control over access to land through ownership by the Tanadgusix Corporation--suggest the means exist for negotiating measures for mitigating potential long-term adverse effects on Aleut sociocultural systems if a terminal is sited there. Overall effects could be moderate.

(18) Impact on Subsistence-Use Patterns

On St. Paul Island, there could be major impacts on subsistence-use patterns if the fur seal population were adversely affected by terminal or related operations, or if interaction with this new sector of the economy resulted in a tendency to diminish the values and orientations associated with subsistence-based living in an Orthodox community. On the other hand, employment of heretofore underemployed resident Aleuts in terminal and related operations could assist in filling the economic vacuum created by the substantial withdrawal of the National Marine Fisheries Service (NMFS) from the Pribilof Islands. Income so derived could improve living conditions in this context and facilitate the harvest of other subsistence resources available to island residents. Such substitution processes, however, could have long-term adverse effects if new dependencies were created on the consequences of nonrenewable resource development.

Impact on subsistence use patterns in St. Paul could be high and low in

Unalaska and Cold Bay.

(19) Impact on Military Uses

This is not a subject discussed in the Alaska OCS Region as there are no restricted areas.

f. Impacts of Alternative II - Subarea Deferrals

This alternative evaluates the possible deferral of 13 subareas. These are in addition to the 14 subareas deferred under Alternative I. None of the additional subarea deferrals included in Alternative II are within this planning area, therefore, the expected environmental impacts of Alternative II in this planning area are identical to the expected impacts of the proposal.

g. Impacts of Alternative III - Add a sale in the Straits of Florida

Adding a sale in the Straits of Florida will not effect this planning area. However, under Alternative III all sales proposed in Alternative I - the proposal, would be held. Therefore, the expected impacts of Alternative III are identical to Alternative I for this planning area.

h. Alternative IV Biennial Leasing

This alternative increases oil reserves from 1,920 MMbbls of oil in the proposal to 2,208 MMbbls and gas reserves from 2,336 BCF to 2,686 BCF. The number of platforms is expected to increase from 7 in the proposal to 8 with exploration wells increasing from 82 to 92 and development and production wells increasing from 229 to 263. The number of sales increases from 2 to 3.

This alternative projects a third sale within the Navarin Basin Planning Area and a 15 percent increase in the resource level and development infrastructure. Although resource levels and development infrastructure would increase by 15 percent, the level of impact of this alternative on all resource categories would be essentially the same as those indicated for the proposal (Alternative I) for the following reasons:

1. The number of oil spills of 1,000 barrels or greater would be the same for both Alternatives I and IV.
2. The amount of drilling fluids, cuttings, and formation waters discharged into the environment would increase by 15 percent with Alternative IV. Although total discharges would increase, only about 1 square kilometer of the planning area would be impaired.
3. Shore-based facilities under both alternatives would be in the same locations (Pribilof Islands, Unalaska, and Cold Bay) and be of comparable size.
4. Manpower requirements, due to the relatively fixed labor require-

ments entailed in the construction of a terminal/processing facility, would be essentially the same as Alternative I.

5. Noise and disturbance as a result of 1 additional platform and 34 production wells over that of Alternative I would be minor.

i. Alternative V - Acceleration Provision

Alternative V (Acceleration Provision) would accelerate the sale schedule outlined for Alternative I by one year. However, the accelerated schedule would not shorten the current prelease process.

Under Alternative V, the resource estimates (1920 MMbbls of oil and 2336 BCF of gas) and development assumptions would be identical to those for Alternative I. Because these assumptions are identical, the effects of Alternative V on all resource categories would be the same as Alternative I except that they would be accelerated by one year.

j. Impacts of Alternative VI - Defer Leasing in Six Planning Areas: North Atlantic, Washington and Oregon, Northern California, Central California, Southern California, and North Aleutian Basin

Selection of Alternative VI would defer leasing in the North Aleutian Planning Area (Alaska Region). The impacts resulting from this alternative would be the same as described for the proposal for the Navarin Planning Area because selecting this alternative does not affect activities in this planning area.

k. Impacts of Alternative VII - No Action

Under this alternative, the Secretary of the Interior would propose not to schedule any oil and gas lease sales for this proposed 5-year program. All potential impacts from OCS oil and gas activities to the physical, biological, and socioeconomic environment resulting from hydrocarbon exploration, development, and production would be eliminated.

Oil and gas are currently the nation's primary energy source. Even with a vigorous conservation program the United States' demand for energy will continue to grow. With the adoption of Alternative VII, the oil and gas that would have been available as a result of this proposed program would no longer contribute to the national domestic production during the life of the program.

With the removal of the potential oil and gas into the national energy reserves, it would necessitate the increased production of energy from other conventional and non-conventional energy sources (see Appendix C), and/or increases in import levels from foreign sources. Impacts resulting from the development of the alternative energy sources are summarized in Section II.A.7 and discussed further in Appendix C.

18. Norton

a. Alternative I

The proposal is to hold 1 sale in the Norton Planning Area. It is estimated that the sale will produce about 102 million barrels (MMbbls) of oil and 470 billion cubic feet (BCF) of gas over a 35-year period. These resources will be produced from 18 production wells from 1 platform. In addition to the oil and gas, about 3.5 to 250 MMbbls of formation water will be produced. Approximately 107 thousand barrels of drilling muds and fluids and 101 thousand barels of drill cuttings could be discharged into the sea over the life of the proposal. About 10 exploration wells will be drilled. It is anticipated that 1 support base will be expanded and that at least 1 onshore facility will be developed. See the discussion in IV.B.11.a.(3)(4) and (5) for a generic discussion of impacts. Area specific analysis follows.

(1) Interrelationships of Proposal with other Projects and Proposals

Section IV.B.11.a.(1) presents a discussion of the interrelationships of the proposal with other projects and proposals for all Alaskan Planning Areas.

(2) Projects Considered in Cumulative Impact Assessment

Section IV.B.15.a.(2) presents a discussion of the projects considered in the cumulative impact assessment for this planning area.

(3) Physical Environment

(a) Impact on water quality

In Norton Basin, anchoring or emplacement of the 10 exploration platforms or the one production platform and entrenchment of 2 pipelines would increase turbidity only temporarily over a limited area. Dredging and gravel island construction (perhaps 1 island) would each appreciably but temporarily increase turbidity over platform discharges of drilling fluids during exploration and production and subsequently recontaminate about 1 percent of the same areas. Production but not exploratory discharge would continue intermittently over 35 years. One oil spill of 1,000 barrels or greater could significantly, but temporarily, increase water column hydrocarbon concentration over several hundred kilometers. See Section IV.B.11.a.(3) for generic impact discussion. The low level of expected activity and discharges will keep water degradation impacts low.

Significant long-term impacts on regional water quality are very unlikely for the proposed action because of the low level of resources and activities. Short-term and local impacts are likely, especially during drilling.

CONCLUSION: Water quality impacts would be low.

CUMULATIVE IMPACTS: Current development and plans for future development for the Norton Basin are limited. No State oil and gas sales are planned offshore. Existing and proposed industry development could appreciably affect marine water quality, particularly the proposed commercial dredging for gold in state waters offshore of Nome.

Gold dredging would also continue for a longer period of time than the few years of pipeline construction. About 63 square kilometers total area would be affected by dredging and/or the increased turbidity resulting from dredging operations. Cumulative oil industry effects are limited to those from possible tankering of Canadian Beaufort Sea oil through the planning area, Norton Sound Sale 57, and oil development further south in the Bering Sea. Cumulative rate of oil spills for this proposal is projected at less than 2 spills of 1,000 barrels or greater. For the proposal alone, however, the most likely number of 1,000 barrel or greater spills reduces to 1.

CONCLUSION: Cumulative impacts on water quality would still be low.

(b) Impact on air quality

In the Norton Basin, effects on air quality from the proposal are expected to be low, based on pristine ambient air quality conditions and an offshore emissions inventory of individual exploratory vessels and production platforms. There will be 10 exploratory wells drilled over a 3 to 4 year period and only 1 production platform will be used in producing the estimated resources. No new, onshore facilities are assumed for the Norton Planning Area. There could be some expansion of the existing (from past sales) facilities. The low level of activity will tend to reduce impacts.

Air quality effects ensuing from the proposal are expected to be analogous to those identified in the EIS's on Lease Sales 46 (Kodiak; USDOI, BLM, 1980) and 60 (Lower Cook Inlet-Shelikof Strait; USDOI, BLM, 1981). Onshore emission sources in more remote areas are expected to be no greater than existing ambient concentrations in the Kenai/Nikiski area, where petroleum production, refining, gas liquefaction, and marine-loading operations occur. In any case, federal PSD review and modeling commensurate with the PSD review process will be required for onshore facilities. Section IV.B.11.a.(3) discusses individual potential effects.

CONCLUSION: Direct effects to air quality from the proposal would be low.

CUMULATIVE EFFECTS: The combined mean oil and gas resources from previous sales and the proposal would still be less than has been produced, transported, and refined in the Kenai/Nikiski region without exceeding air quality standards. Pollutants from other existing and proposed offshore oil and gas lease sales would not affect Norton Basin air quality.

Future mining activities in the Seward Peninsula could also affect air quality, particularly total suspended particulate concentrations near mines and their roadways and associated harbor facilities at Cape Nome if large-scale development occurred. Any such development would also require commensurate air quality analysis prior to permit approvals.

Thus, cumulatively, potential mining and oil and gas activities are not likely to more than locally affect air quality. With the use of available emission-control technologies, the PSD level for any pollutant other than total suspended particulates is unlikely to be approached. Additional air quality analysis will be required of any potential polluter.

CONCLUSION: Cumulative impacts on air quality are unlikely to be more than moderate.

(4) Biological Environment

(a) Impact on plankton and benthos

Planktonic and benthic resources of greatest concern, either due to their abundance, commercial importance, or trophic relationships, are: (1) the linkage between primary producers and zooplankton consumers; (2) the brown alga, *Fucus*, which is used extensively by herring as a substrate for egg deposition; (3) ampeliscid amphipods, which are an important food of migrating, endangered gray whales; and (4) king crabs, which are harvested commercially and for subsistence purposes. Other benthic invertebrates, such as echinoderms, bivalves, and the gastropod mollusk, *Neptunea*, derive importance from their abundance and trophic interactions.

Marine plants and invertebrates have lifespans ranging from a few days to tens of years. Organisms with short lifespans relative to the scale of the disturbance (whether it be oil spills - one over 1,000 barrels estimated - or construction activities) are very likely to show effects. Oil spills are more likely to cause widespread negative effects to marine plants and invertebrates than are other activities associated with exploration, development, and production of oil and gas resources. King crabs would be most vulnerable to an oil spill during the spring and summer as planktonic larvae. Since egg release, molting, and mating occur about the same time and multiple-age classes are present, an oil spill occurring at this time could affect population numbers for several generations.

Ampeliscid amphipods, an important food for migrating gray whales, are very sensitive to oil and could suffer effects if a large portion of the regional population was killed and/or recruitment into oil-contaminated areas was greatly reduced, however only one spill over 1,000 barrels is estimated. For both king crabs and ampeliscid amphipods, effects are likely. Planktonic organisms, whose lifespans range from about 1 week to 1 year are, in general, expected to be affected little by oil and gas-related activities; the short-lived species and those for whom reproduction or recruitment are affected could show some effects. For other abundant invertebrates, effects are expected to be small, since most of these organisms have broad distributions as adults and/or as larvae.

The brown alga, *Fucus* sp., which serves as substrate for herring eggs, is expected to show some effects if contacted by spilled oil, but there is a very low probability of oil reaching its habitats.

Effects from other activities such as seismic exploration; discharge of drilling muds (107 thousand bbls), cuttings (101 thousand bbls) and formation waters (up to 250 MMbbls) and construction activities (1 production platform), should be very localized. Effects from these activities should be small, with the exception of construction activities, which should have effects on sedentary benthic invertebrates due to the long-term (relative to the generation times of these organisms) localized changes caused by installation of two pipelines, 1 production platform, and some enlargement of onshore facilities.

CONCLUSION: Effects on planktonic and benthic organisms are generally expected to be low.

CUMULATIVE IMPACTS: In the Norton Basin area, cumulative effects due to development of potential resources will come mainly from activities associated with oil and gas development. Mining ventures will also affect marine organisms.

A commercial gold-dredging venture plans to commence a 10-year operation in July 1985 or 1986. About 63 square kilometers of area would be affected by the dredging or increased turbidity associated with this operation. Although effects on planktonic invertebrates should be low on a regional scale, the potential for redisturbance of affected areas could lead to moderate effects on benthic invertebrates.

Activities associated with offshore oil and gas sales that are likely to affect marine plants and invertebrates and that increase under the cumulative case are drilling of exploration and delineation (45 wells), production, and service (112 wells) wells; construction of four production platforms; and installation of 2 pipelines to carry oil and gas. In drilling the anticipated wells, 610 thousand barrels of drilling muds would be used. Although this figure represents an impressive quantity, discharges of muds and cuttings during years of peak discharge would amount to 610 thousand and 606 thousand barrels respectively. Under the cumulative case, there is an increase in the probability (from 25% to 83% of two or more oil spills over 1,000 barrels occurring.

Because the probability of oil spills increases in the cumulative case, effects on some of plankton are expected to be affected; on Fucus, low effects are most likely; for ampeliscid amphipods and king crabs, low effects are likely, but moderate effects could also occur under certain conditions; and for other abundant benthic invertebrates, effects should be low, although moderate effects could result from construction activities.

CONCLUSION: Considered as a group, planktonic and benthic organisms are generally expected to experience moderate impacts.

(b) Impact on fish resources

Activities associated with exploration of oil and gas resources in Norton Basin could have several potential effects on fish. Of all the potential direct effects of oil and gas development on fishes in the Norton Basin area, oil spills (one over 1,000 barrels expected) pose the greatest threat. Adult fish are not likely to suffer great mortality due to an oil spill, but larvae, eggs, and juveniles are more vulnerable. The death of adult fish has occurred almost immediately following some oil spills (the Florida and Amoco Cadiz; Hampson and Sanders, 1969; Teal and Howarth, 1984); however, lethal effects to adults may pose less threat to commercial fisheries than damage to eggs and larvae or changes in the ecosystem supporting the fishery (Teal and Howarth, 1984). In particular, species with floating eggs (e.g., arctic cod) or eggs in more vulnerable positions (e.g., herring and capelin eggs and developing larvae attached to substrates in the intertidal and/or shallow subtidal) could suffer extensive mortality (Jangaard, 1974). Capelin spawn in coastal sandy areas near Nome and thus are more susceptible to negative effects from an oil spill than are herring, due to the higher probability of an oil spill (Nome will function as a support and supply base) striking these areas and the more restricted known spawning location of capelin. The effect of an oil spill on capelin is expected to be low.

Salmon migrating to spawning areas (Yukon River) and juvenile stages in nearshore areas also are susceptible to spilled oil. All stages of pink salmon are susceptible, since this species may spawn in tidal areas. Although the effects of an oil spill (1 over 1,000 barrels expected) on salmon in the Norton Basin region are expected to be low, moderate effects could occur if the oil spill occurred when individuals, especially smolts, were in nearshore waters.

Habitat disruption and increased turbidity are expected to have little effect on fisheries, the overall effect of gravel-island (perhaps 1) and pipeline construction (2) should be low for fisheries. A similar effect on fisheries is expected to result from possible construction of a gravel causeway for pipeline land fall.

Effects from other activities (seismic exploration and discharge of drilling muds) should be very localized. The effect of these activities on fisheries is expected to be very low.

CONCLUSION: Oil and gas development in the Norton Basin is expected to have a low impact on fisheries, although for some species (e.g., salmon and capelin), moderate effects are possible if spawning individuals are killed. The only significant effects are anticipated to be caused by oil spills.

CUMULATIVE IMPACTS: Since resource levels (640 MMbbls of oil) are higher for cumulative leasing, and development and production activities are expected to be greater (4 production platforms), potential effects are also more probable. The probability of oil spills increases to 2 over 1,000 barrels, thus the occurrence of effects from a spill are more likely. Thus, those fisheries that spawn in the coastal areas are more likely to be affected. Although the probability of an oil spill increases, the effects for salmon are judged to be the same as in the proposal, generally moderate. The probability of effects on capelin would probably be moderate, eggs and larvae in nearshore waters might be killed (Jangaard, 1974).

A commercial gold-dredging venture plans to commence a 10-year operation in July 1985 or 1986. Dredging should occur from May through October. About 63 square kilometers of area would be affected by the dredging or increased turbidity associated with the operation. Fish may be temporarily displaced by the dredging operations and a few individuals may die in the mechanical operation of the process. Fish that spawn in nearshore waters may be disturbed; and, consequently, spawning might be decreased in very localized areas. Prey of demersal fishes or fishes in nearshore zones may be decreased; again, in a localized area. The effect on fisheries of this gold-dredging venture should be low.

Effects of construction activities, dredging, and discharges of drilling fluids and formation waters are expected to range from very low to low.

CONCLUSION: In general, the effect of the cumulative case on fishes is judged to be low, with some potential for moderate effects on salmon and capelin if spawning individuals are killed by spilled oil.

(c) Impact on marine mammals

Eleven species of nonendangered marine mammals-Pacific walrus, ringed bearded, spotted, and ribbon seals, polar bears, beluga killer, and minke whales, and small numbers of harbor and Dall's porpoises commonly occur in a portion of or throughout the Norton Basin Planning Area and are very likely to have some interaction with OCS industrial activities. Oil pollution and distrubance due to increased human activity and habitat alterations could adversely affect marine mammal populations found in the proposed area. The general effects of oil spills, noise and disturbance, and habitat alterations on marine mammals are discussed in Section IV.D.11.a.(4) Impact on Marine Mammals.

An estimated 225,000 or 90% of the Pacific walrus population and over 300,000 bearded, spotted, ribbon, and ringed seals occurring in the Norton Basin are the primary marine mammal populations at risk from potential oil spills that may be associated with the proposal. However, oil spills (one over 1,000 barrels expected) that may be associated with the proposal are likely to have no more than low effects of regional nonendangered marine mammal populations. If the oil spill occurred during the ice season in the western part of the Norton Basin, a few hundred to a few thousand walruses or perhaps an estimated 100 ice seals could be contaminated. There could be a possible loss of all contaminated walrus calves and seal pups of the affected group in a severe situation where the oil spill would contaminate major ice leads being used by large numbers of migrating walruses and seals. This loss would represent a low effect on overall walrus and seal populations that occur in the planning area since these losses are likely to be replaced within one or two years.

An oil spill that may occur within or contact open-water and broken-pack-ice areas north of St. Lawrence Island could contaminate a few to perhaps 10 or 20 polar bears in an extreme situation and result in the death of individuals heavi~~ly~~ coated with oil. This loss is likely to have a low effect on the polar bear population. The possibility of loss of even 10 or 20 polar bears to an oil spill in the northern Bering Sea would be very remote.

Groups of beluga whales and other cetaceans numbering perhaps 10 to a few hundred could suface in oil-contaminated ice leads, and some of these animals could actually contact oil on the surface or in an oil-water emulsion layer covering part of the leads. This brief exposure is likely to have very temporary irritation effects on belugas (see preceding discussion of Impacts of Oil Sec. IV.D.11.a.(4)). Most of the oil that contacts the whale's skin is likely to be washed away when the animal dives. Also, any oil that might adhere to the whales would be subject to weathering. The most toxic and most harmful hydrocarbons in the oil spill also would be rapidly dispersed by wave and wind action, which could greatly reduce the time of exposure. No beluga whales or other cetaceans are likely to die from the probable brief exposure to an oil spill. If exposure of the whales to a spill were prolonged due to severe ice conditions that might prevent the whales from moving out of a contaminated lead system, oil contact and inhalation of toxic hydrocarbon fumes could possibly contribute to the death of very weak or diseased individuals through increase in physiological stress. However, oil to which the whales are exposed also would be evaporating and dispersing, thus limiting the degree of exposure. Even in a situation with whales trapped in a contaminated lead, the number of whales severely affected is likely to be very low to low.

Oil spills (one over 1,000 barrels expected) that may occur during the summer season are likely to contaminate no more than a few seals or walruses in offshore habitats, while an oil spill that may contact a walrus or spotted seal haulout area may contaminate a few hundred adult animals. However, few if any of these adult walruses or seals are likely to die as a result. These effects are likely to be very low to low on marine mammal populations. Although oil spills associated with the proposal could have direct effects on some marine mammal food organisms within very local areas near the spill sites, marine mammals in the northern Bering Sea are opportunistic feeders. They exhibit highly mobile foraging habits and can easily shift from affected local food organisms to unaffected prey and unaffected habitat areas. Even a 100,000 barrel oil spill would not kill sufficient numbers of prey organisms used by marine mammals to measurably reduce the overall food sources of any marine mammal species population above the natural variability in prey populations. Any local reduction in pelagic or epibenthic food organisms due to any oil spill is likely to be restored by rapid recruitment after the spill has been dispersed. Thus, indirect effects of oil spills on marine mammals are likely to be very low to low.

Traffic from the helicopters and supply vessels assumed to be associated with exploration and development (10 wells over 3 years)--as well as seismic boats--would be primary sources of noise and disturbance of marine mammals. The most serious disturbance could come from aircraft flights over walrus nursery herds hauled out on the ice during spring migration. Such disturbance could cause physical injury and death to walrus calves by panic-stricken walrus cows. Disturbance also may cause abandonment of walrus calves by the cows. However, the number of nursery herds of walruses disturbed by aircraft flights is likely to be few and represent low impacts. Seals and beluga whales may be displaced along aircraft or vessel routes--probably with very low effects on the populations.

The assumed oil-tanker trips and LNG-tanker trips (about 34 trips/year) to and from Cape Nome (a possible terminal site) each year during oil production may temporarily interrupt the movements of beluga whales, seals, and walruses when the vessels pass nearby. However, this level of vessel traffic is very unlikely to block or greatly delay marine mammal migrations.

Severe ice conditions are likely to have a far greater influence on marine mammal spring and fall migration patterns than vessel traffic associated with the leasing proposal. Tanker traffic is very likely to have no more than low effects on marine mammal migration patterns. Overall noise and disturbance effects on marine mammals are not likely to exceed low impact levels.

Dredging (for pipelines and perhaps 1 artificial island), drill-platform construction (one production platform), and pipelaying (2 pipelines) and burial could temporarily displace marine mammals and some food sources near these sites during construction activities. Some marine mammals could continue to be disturbed and perhaps migration movements and habitat use could continue to be diverted a few kilometers away from the production platforms. However, this displacement is likely to be very small in comparison to the natural variability in habitat use and variability in migration patterns. Thus, noise and disturbance associated with dredging and with platform construction and operations--as well as other adverse habitat changes--are likely to be low to very low. The possible tanker-terminal facility assumed to be built at Cape Nome could temporarily disturb and perhaps displace a small number of ringed seals that seasonally inhabit shorefast ice near the site. However, this displacement would have no more than a low effect on the local seal population.

CONCLUSION: The combined effects on non-endangered marine mammals of oil spills, noise and disturbance, and adverse habitat changes associated with the proposal are likely to be low.

CUMULATIVE IMPACTS: The additive effects of other ongoing and planned projects, as well as the proposal, on nonendangered marine mammals are discussed in this section. Although the probability of any or all planned and ongoing projects reaching developmental stages generally is unknown, this analysis assumes that all the following projects do reach development stages. These projects could affect marine mammals by oil spills, noise and disturbance, and habitat alteration. Cumulative OCS oil and gas activities, possible Canadian tankering in the Bering Sea-Norton Basin and onshore mining and port-development activities in Norton Sound would subject marine mammals to a variety of aggregate effects. Potential oil spills (two over 1,000 barrels expected) from OCS lease and transportation of oil and LNG could have the most effects on marine mammals, particularly if large numbers (several thousand) of walruses, and ice seals were contaminated if a spill occurred within or contacted leads or polynyas north or west of St. Lawrence Island when large numbers of walrus cows and calves were present, or sizable numbers of ringed spotted and bearded seals were migrating through the lead systems. If several thousand walruses and a small number of ice seals were contaminated, several walrus calves, some ice seal pups, and perhaps small numbers of highly stressed adult animals would be killed. These losses are likely to represent low to moderate impacts on regional marine mammal populations if losses took up to one generation to replace.

Cumulative impacts of oil spills (2 over 1,000 barrels) in Norton Sound, particularly near the assumed tanker terminal at Cape Nome, could result in the loss of small number of ringed seal pups and sublethal effects on perhaps a few hundred spotted seals and adult walruses (low population effects). Local and short-term reduction in the availability of food organisms due to cumulative oil spills (see Sec. IV.B.11.a. and b.) are likely to have a low effect on marine mammal populations.

Cumulative increases in aircraft and vessel traffic associated with OCS oil and gas development transportation and ore-carrier traffic from potential onshore mining activities on the Seward Peninsula would be the primary noise and disturbance sources to marine mammals in the Norton Basin and other habitats in the Bering Sea. Low-flying aircraft are likely to cause the most apparent effects, with direct injury or death of walrus calves or seal pups if walrus and seals are panic-stricken into the water. Repeated aircraft disturbance of walrus nursery herds could significantly reduce calf survival, while repeated disturbance of adult male walruses and spotted seals could cause the abandonment of traditional haulout sites. The abandonment of local haulout and breeding sites may last for one generation or more and could represent moderate effects on a species population. If oil and gas production takes place on both Sale 57 and Sale 100 leases, more than one hundred oil tanker and LNG tanker passages per year could occur through Norton Basin. This cumulative increase in vessel traffic with added supply-boat and seismic-vessel activity and perhaps 80 ore-carrier trips per year from the potential Lost River onshore mining project could disturb walruses, seals, and whales as the vessels pass nearby, causing the animals to temporarily leave the area. This displacement is likey to be short-term and represent no more than low effects on marine mammals distributions.

CONCLUSION: Cumulative OCS oil and gas activities in the Bering Sea--including the leasing proposal in the Norton Basin--and possible ore-carrier traffic from onshore mining projects probably would have a combined moderate impact on nonendangered marine mammal populations.

(d) Impact on coastal and marine birds

The effects of an oil spill in the Norton Basin area on birds would vary with the season, volume, nature, and duration of the spill; species and numbers of birds occurring in the areas affected; and many other variables.

If the one estimated spill over 1,000 barrels occurs during the winter, it could have no immediate effects on most birds unless it contacted overwintering and waterfowl and alcids in ice leads and polynyas. However, it is possible that oil could remain in the ice after winter cleanup efforts and might directly affect many birds during the following spring breakup period or indirectly affect them through changes or reductions in food-source availability. Oil spills that occur or melt out during spring breakup, or during the open-water period are likely to have immediate effects on some birds. Species most likely to suffer direct mortality would be alcids, particularly murres, and also sea ducks and cormorants. Depending on the timing and areas contacted by the spill, other birds such as phalaropes, brants, and other waterfowl may also be directly contaminated by oil that contacts leads in the ice during spring or coastal marshes or lagoons during the summer-fall feeding periods.

In general, the one oil spill associated with the proposal could result in the loss of several hundred or perhaps several thousand seabirds if ice leads and open-water areas near bird colonies were contaminated during the spring. If several thousand birds were killed this would be a moderate effect, depending on which species suffered the greatest losses. If an oil spill occurred in the summer-early fall season during a storm surge, and coastal wetlands or lagoons were heavily contaminated with oil, perhaps several hundred waterfowl (particularly brant and emperor geese) and some shorebirds could be directly contaminated, with long-term habitat contamination occurring in marshland habitats contacted by the oil.

In the very remote chance that the oil spill contacted the Yukon Delta, only a small portion of the Delta coastline is likely to be contaminated with oil. In this case, perhaps a few hundred brant, emperor geese, or other waterfowl species could be lost and some oiled habitats might remain contaminated for several years. This event could have a moderate effect on waterfowl species populations that have recently declined for other reasons. High effects on brants, cackling Canada geese, and emperor geese would be possible if large feeding or nesting habitat areas of one of these species were contaminated with oil and several hundred to several thousand geese of these species were lost. However, the chance of this occurring is extremely remote.

Potential noise and disturbance effects on marine and coastal birds would come from helicopters supporting exploration (10 wells over 3 years) and the one production platform. Air traffic near bird colonies could greatly disturb nesting birds, resulting in the loss of eggs and chicks. However, the amount of air traffic is not likely to disturb more than a few local bird colonies. Noise and disturbance effects on birds from aircraft traffic are not likely to exceed low. Vessel traffic could temporarily disturb birds as the vessels pass near feeding flocks, resulting in short-term diving or flight responses.

Vessel-traffic disturbance of birds is likely to be very brief and would have very low effects on bird populations.

During construction activities (one to 2 years), several hundred birds could be temporarily displaced near platform and dredging sites as well as near possible terrestrial gravel-storage sites. However, the overall effects of dredging, production-platform construction (one), and trenching and pipeline burial are likely to be low.

Onshore activities that may affect birds could include shoreline alterations (from 2 pipeline landfalls), facility siting (one), gravel mining (possible), filling, onshore-pipeline burial, and road construction in the Cape Nome area. During development, some local loss of habitat from facility construction would occur. However, onshore-development activities are likely to have no more than low effects on birds because of the relatively low level of activity.

CONCLUSION: The combined overall effects of oil spills, noise and disturbance, and adverse habitat changes on marine and coastal birds from the proposal are likely to be moderate.

CUMULATIVE IMPACTS: Cumulative OCS oil and gas activities in the Bering Sea and onshore-mining and port-development activities would subject marine and coastal birds and their seasonal habitats to a variety of aggregate effects. Potential oil spills from OCS leases and transportation (two oil spills could assumed) could have the most serious direct effects on birds, particularly large seabird concentrations located near oil activities. Oil spills from drilling operations and vessel traffic could have moderate effects on some seabird species if consecutive spills resulted in consecutive losses of several thousand birds from the same colony. Some alcid species could experience long-term population declines through the loss of breeding birds. However, the chance of two or more spills contacting the same bird population is remote.

Colonial seabirds could also experience local reductions in nesting success from cumulative aircraft disturbance of colonies near support facilities. These effects are likely to be moderate. Cumulative oil-spill effects on waterfowl and shorebirds are likely to involve local habitat areas, with the direct loss of some waterfowl and long-term local effects on marshland habitats that become contaminated. These effects are likely to be moderate. However, if extensive areas of coastal marshland were oiled and significant numbers of brant, emperor geese, or cackling Canada geese were lost, high effects on waterfowl could result. Onshore and offshore mining and port-development projects in the Norton Sound area are likely to have local and short-term effects on marine and coastal bird populations, these would represent low effects on regional populations.

CONCLUSION: Cumulative OCS oil and gas activities in the Bering Sea and onshore coastal development in the region are likely to have moderate impacts on marine and coastal birds.

(e) Impact on Endangered and Threatened Species

Four endangered whale species have been sighted in or adjacent to the planning area: bowhead, gray, fin and humpback. Both species of the peregrine falcon range throughout the nearshore land areas. The Eskimo curlew was historically common but is thought to be extinct in Alaska. There are no listed plant species in areas adjacent to the planning area. Refer to Section IV.B.11.a.(4) in this document and Sale 100 FEIS for details on effects to endangered and threatened species that may occur as a result of oil and gas activities associated with the proposal.

A formal Section 7 Endangered Species Consultation of MMS with NMFS and the FWS was conducted for the proposed Sales 57 (1980) and 100 in the Norton Planning Area. The latest biological consultation with the FWS and NMFS was initiated for Sale 100 in July 1984. The FWS consultation covered arctic peregrine falcon and Eskimo curlew. The NMFS consultation covered fin, sei, blue, right, humpback, sperm, gray and bowhead whales. See Ch. V. for a further description of the consultation process for Section 7 of the Endangered Species Act of 1973.

There is a 15% marginal probability of discovering the 102 MMbbls of oil speculated to be in the planning area. It is expected that up to 10 exploratory/delination wells and up to 18 development/production wells will be drilled from one platform. One oil spill over 1,000 barrels could occur as a result of activities in the planning area. Oil could be piped to a new landfall base at Cape Nome. From there, ice breaking tankers could transport the oil to the transshipment facility in Balboa Bay via Unimak Pass or directly to market. An oil spill could occur in the winter months as a result of a tanker accident.

Ice-breaking tankers are quite loud and at certain times the sound produced is predicted to be audible at 300 km under ideal conditions. Noises associated with pipelaying activities may persist over two open water seasons due to the short ice free period. Geophysical seismic exploration is another loud noise source that has been demonstrated to affect whales. Construction of infrastructure because of necessary expansion at Cape Nome is most likely to be heard at short distances out to sea.

Bowhead whales pass through the planning area during the spring and fall migrations, generally west of St. Lawrence Island. Fin and humpback whales summer in the Gulf of Anadyr and in the Chukchi Sea. The primary summer feeding area for gray whales is located in the Chirikov Basin west of Norton Sound. Fouling of benthic food specimens from spilled oil is a possibility although only 1 spill over 1,000 barrels is expected. Tankering noise (about 34 trips a year) could displace migrating whales especially during the fall when they are more likely to travel to the east of St. Lawrence Island. Construction of infrastructure in the Cape Nome area has the potential for displacing nesting or foraging peregines although no new facilities are anticipated.

CONCLUSION: Effects of the proposal on endangered species are expected to be low.

CUMULATIVE IMPACTS: Cumulative impacts will result from the installation of platforms (4) and associated support traffic in those planning areas along the whale's migratory routes or in summer feeding areas. Long term ensonification of areas could result in the displacement of whales. This would be especially detrimental to the survival of the species if access to prime feeding areas was denied. Death of prey from oil spills would have a long term expression in reduced fecundity rates. Displacement of nesting peregrines could result in the loss of several-year classes.

CONCLUSION: Impacts to endangered species are not expected to exceed moderate on a cumulative basis.

(f) Impact on estuaries and wetlands

These topics are discussed and impacts analyzed where they occur as habitat for the fish and wildlife species in (4)(a) through (4)(f) in this section.

(g) Impact on areas of special concern

These areas are all habitat for the fish and wildlife species in (4)(a) through (4)(f) and impacts are discussed as they occur in the planning areas.

(h) Impact on Marine Sanctuaries

There are no marine sanctuaries in the Alaska OCS Region.

(5) Socioeconomic Environment

(a) Impact on employment and demographic conditions

The projected pipeline landfall and terminal could be at Cape Nome. Tankers would be loaded and transport product to a transshipment point on the south side of the Alaska Peninsula directly south to market. The marine and air support bases could be in Nome.

Population increases in the Norton Planning Area and around Nome particularly related to the proposal equal about 150 people. As a result, most effects on infrastructure because of this proposal are low. This is true for the electrical system, police force, hospital beds, physicians, and housing starts. Waste water-treatment facilities are needed at the present time, and an application has been made to construct such a facility. If the facility is not constructed, however, OCS-related workers would aggravate the current situation. Even though they would only be a negligible portion of the population, the effect could be greater. Very low effects could occur with respect to the school system because the school-age population associated with the proposal is low.

In the planning area, sharing systems and task groups involved in subsistence are central to the organization of communities, families, and cultural values. Hence a disruption to a village's subsistence system may also affect its sociocultural system. Impacts on subsistence may be moderate in the Nome/Cape Nome and St. Lawrence Island regions and low in the inner Norton and Yukon River Delta regions. The moderate impacts may produce short-term disruptions of sharing systems and task groups but should not lead to a tendency toward their replacement. Both moderate and minor impacts could produce social tensions within the study area which could, in turn, lead to raised levels of socially dysfunctional behavior.

Onshore support facilities could be located at Cape Nome. For this reason, Nome may experience some increased social stratification and interethnic tensions. Kin groups, task groups, and sharing networks in Nome may experience some disruption. This community is especially likely to exhibit rising levels of socially dysfunctional behavior.

The effect of the proposal on the City of Nome is expected to be moderate in terms of the resulting increases in the resident population and the number of jobs held by residents of Nome. It is assumed that facilities constructed for previous OCS Sales (57 and 100) could be further used for activities associated with the proposal. These assumptions reduce the projected employment effects from the proposal.

The largest number of additional jobs created in the region as a result of the proposal would occur offshore from Nome. The number of offshore jobs would exceed 660 during most of the period from 1997 to the year 1999. Almost all of the offshore jobs are expected to be held by commuters who would leave the region frequently for extended periods of rest and recreation.

However, during the production phase of activity (beginning in 1998), a small number of the offshore jobs may be held by workers who reside in Nome or in the smaller communities in the Nome region. The offshore jobs created by the proposal would benefit Nome and would be in addition to larger numbers of offshore jobs which could be created by Sale 57 held in March 1983 or proposed Sale 100.

The pattern of increase in the resident population of Nome, expected to occur as the result of the proposal is similar to the pattern of increase in the employment of Nome residents. During the production phase, substantially larger population effects are anticipated than during the exploration phase, as compared to the projected population in the absence of the proposal. At no time are the effects of the proposed sale expected to increase the total resident population of Nome substantially.

Due to the employment and population effects of the proposal, it is possible that the sale could result in a housing shortage and a related increase in housing costs in the City of Nome. In the development and production phases of petroleum activity, a key factor is whether or not most onshore petroleum jobs resulting from the proposal will be filled by commuters housed in a dormitory at Cape Nome. If all onshore petroleum workers are housed in traditional types of housing within the City of Nome, the possibility of a housing shortage and related increases in housing costs could be quite serious. However, as indicated above, this EIS is being written on the assumption that most onshore petroleum workers will be housed in an enclave at Cape Nome.

CONCLUSION: The impact on employment and demographic conditions in the

Nome area as a result of the proposal would be moderate.

CUMULATIVE IMPACTS: The projects considered most likely in the cumulative description are Sale 57, Sale 100, tankering from oil production for the north, and construction of the port at Nome. Although the existing elementary school is inadequate and due for replacement, 36 percent of all classrooms forecast for 1995 would be new and related primarily to students associated with growth from Sale 57. Moderate increases in the police force, housing, and hospital beds noted in the text also would be Sale 57 related. Adding Sale 100 extends the need for these facilities into the future and, as noted in the conclusion, creates some additional requirements for electrical generation, police force, and housing. This proposal could also increase demands somewhat on the infrastructure of Nome but not to the extent of previous sales. Health care facilities could approach moderate impact.

The medium-draft port should be constructed prior to the proposed activities. Since most of the workers for the port construction would be temporary, they should not strain the infrastructure cumulatively.

If the port is constructed, the only other major activity that could affect Nome is mining. However, Lost River Mine, the closest to reality, would have an enclave on site and ship ore out of its own terminal. Other mining activities that would be more likely to use the port are too uncertain to assess. It is possible that towards the end of the forecast period, mining sites with access to the road system will generate additional residents in Nome.

CONCLUSION: Combining the infrastructure requirements generated by Sale 57 and Sale 100, and this proposal, Nome would experience a moderate cumulative impact on its school system, law enforcement, and housing, the same as the proposal.

(b) Impact on coastal land use

The scenario for the proposed action postulates the possibility of a tanker-loading facility near the city of Nome, at Cape Nome. It further hypothesizes that marine and air support during the developmental and production stages could issue from the City of Nome. The site of the hypothesized terminal facility is vacant and lies outside of the city limits of Nome within the Bering Straits CRSA (Coastal Resource Service Area). Current land uses within the subject area do not include industrial or energy related facilities. However, State land use standards which govern facility siting within the Bering Straits CRSA qualify docks and petroleum transfer facilities for shoreland locations. Given the satisfaction of other restraining criteria the development of a Cape Nome facility would be feasible. In regard to Nome the municipality has already dedicated acreage to industrial storage yards and has in place a coastal land use plan.

CONCLUSION: Land use effects would be low.

CUMULATIVE IMPACTS: The proposed action would be in concert with previously held sales, Federal offshore Sale number 57, and possibly Sale 100. As a result, existing infrastructure would absorb much of the proposals potential effects, as it is likely that few additional onshore structures would need to be constructed.

CONCLUSION: Cumulative effects would be low.

(c) Impact on commercial fisheries

The probable extent of interference with commercial and subsistence fishing due to fishing-gear loss; loss of ocean-fishing space; fishing-vessel collisions; effects of seismic surveys; dredging or related construction activities; and discharges of drilling muds, cuttings (about 208 thousand barrels), and formation waters (up to 250 MMbbls) are described in the first of the following subsections. The second of the following subsections discusses the degree to which oil spills (one over 1,000 barrels assumed) are expected to affect commercial and subsistence fishing in the region. The third of the subsections below describes other types of effects that the proposal could have on the commercial and subsistence fisheries.

Virtually all commercial harvesting of salmon, herring, and other species of finfish in this region occur in the rivers and tributaries or in coastal waters less than 3 miles from shore. The proposed area is no closer than 3 miles from shore at any point. Consequently, the only significant area of potential conflict between petroleum-industry activities and fishing would be the area in which petroleum pipelines are extended to shore. However, pipelines to shore would be buried in all waters of 30 meters in depth or less, thereby removing most of the area of potential conflict. Furthermore, the principal types of gear used for the harvesting of finfish in this region (gillnets and seines) are unlikely to suffer damage due to contact with unburied pipelines. Therefore, in view of the very limited possibilities for potential conflict with finfish harvesting, it is estimated that the combined result of all estimated fishing gear damage, loss of ocean fishing space, number of fishing-vessel collisions, and negative effects from petroleum drilling and related activities associated with the proposal are very low. The possibility does exist, however, that a fishing vessel passing through Norton Sound might collide with a petroleum industry vessel or the one petroleum production platform. Commercial and subsistence fishing for crab during the winter months both take place through the shorefast ice. A very high percentage of the winter crab harvest is taken in locations within 3 miles of shore. Because the proposed area is no closer than 3 miles from shore at any point, effects of gear loss, loss of ocean-fishing space, and loss resulting from drilling and related activities would be very low. Vessel collisions obviously would not occur in the ice fishery.

The summer fishery for red king crab is an offshore fishery within the proposed area. Therefore, possibilities do exist for sale-related activities to interfere with this fishery by causing fishing gear loss, loss of ocean fishing space, fishing-vessel collisions, and negative effects from drilling and related activities. The analysis of effects from these causes presented in Section IV.B.11.a. indicates that the resulting economic loss to the summer red king crab fishery would be very low.

An analysis of the potential effects of oil spills (one over 1,000 barrels in 35 years) on finfish throughout the greater Nome region would be low.

For both the summer fishery and the winter (ice) fishery, the analysis presented in Section IV.B.11.a. indicates that the economic loss from the mean estimated effects of oil spills would be low.

Onshore gravel mining and other onshore construction work could have adverse effects on the fisheries resources of the area if such activities are not carefully monitored and done in accordance with the best known practices. The effects due to onshore construction would probably be very low.

All of the types of disturbances discussed above are expected to have the combined result of a low effect on the commercial fisheries of the Nome-Norton Sound-Yukon Delta Region.

CONCLUSION: The impact of the proposal on the fisheries of the Nome-Norton Sound-Yukon Region would be low.

CUMULATIVE IMPACTS: In terms of increased potential damage to the fisheries of the greater Nome region, the most important difference between the proposal and the cumulative case scenario used in preparing this EIS is the inclusion in the cumulative case of OCS Sale 57 held in March 1983 and proposed Sale 100. The estimated probability of one or more (2 spills are assumed) oil spills of 1,000 barrels or greater is higher than for the proposal alone. For that reason, the estimated effect of the cumulative case is moderate, as compared to low for the mean case.

CONCLUSION: The estimated impact of the cumulative case on commercial fisheries is moderate.

(d) Impact on recreation and tourism

Most effects on recreation and tourism would be changes in economic values and noneconomic qualities. Changes in the number of users, property values, and visual qualities are examples.

Effects are similar, although less because of reduced activity, to those given in the Sale 100 FEIS (USDOI, MMS, 1985). The Sale 100 final EIS states that the direct effect on visual and wilderness resources would be low and short term. Significant short-term recreation-tourism changes may occur locally because of competition for limited local recreation-tourism facilities. More regional short term effects would result from competition between Nome and/or village residents and OCS employees for fish and game resources. Short term effects due to oil spills (1 over 1,000 barrels expected) would also occur.

The Norton Sound area is expected to produce 102 million bbls of oil and 470 billion cubic feet of gas. The probability of hydrocarbons is 0.15. Based on these figures one spill greater than 1,000 barrels is expected to occur during the production period (35 years).

It is possible that there will be partial closure of some public water-oriented recreational sites for a short period during the summer because of construction or the one spill. There will be some lowering of the quality of resources. However, the proposal is expected to affect the recreational tourism resources very slightly.

CONCLUSION: Impact on recreation and tourism would be low.

CUMULATIVE IMPACTS: Cumulative effects on recreation and tourism are caused by increased population and access caused by Federal and State oil and gas leasing activities, other projects that may take place and the increased emphasis placed by the State on tourism. The sheer size of the Norton Planning Area, its present sparce population and access and the very low level of proposed major programs will tend to keep cumulative impacts low. Because of the assumed concentration of effort around Nome, recreational resources, primarily sport fishing, could experience low impacts.

CONCLUSION: Cumulative impacts would be low.

(e) Impacts on archaeological resources

Impacts on archaeological resources would result from disturbance to underwater landforms, shipwrecks, and historic sites. Onshore prehistoric and historic sites may be affected by increases in industrial populations which in visiting the site accidently disturb it.

Effects would be similar, although smaller because of smaller oil and gas resources, to those effects given in the Sale 100 FEIS (USDOI, MMS, 1985). The effects of the proposal on both offshore and onshore resources are expected to be low.

The Norton Sound Planning Area is expected to produce 102 million bbls of oil and 470 billion cubic feet of gas. The probability of hydrocarbons is 0.15.

Based on these figures one spill greater than 1,000 barrels is assumed to occur during the proposal period (35 years).

Taking underwater landforms, shipwrecks, and historic sites of the Norton Sound lease schedule proposal into consideration the effects would be slightly higher than very low in that unique archaeological or historical resources exist within the area. These may be somewhat disturbed but to a low degree due to the anticipated low level of disturbance factors coupled with the low probability of interaction between oil and gas development activities and archaeological resources.

CONCLUSION: Effects on cultural resources would be low.

CUMULATIVE IMPACTS: The major actions affecting archaeological resources are the activities associated with federal and state oil and gas lease sales. The cumulative effects of other private, state and federal projects, together with the proposal, result in an unlikely chance of interaction with archaeological resources.

CONCLUSION: The cumulative effects would be low.

(f) Impacts on transportation systems

Marine support for offshore exploratory and development operations would issue primarily from sources outside of the area. Drilling supplies, consumable goods, pipeline and other bulk items would be delivered to the drill site. They would be offloaded into "workboats" which would be perminently stationed at the drilling site. Significant local marine traffic could be generated by the transport of bulk water and fuel to the drill sites; however traffic levels would be decidedly effected by the utilization and transport of onshore gravel for an offshore artificial island construction. Tanker traffic generated by the proposal would be mininal amounting to 34 trips per year. The tanker loading terminal is assumed to be in place as a result of a previous lease sale within the area.

Air transportation is expected to provide a vital link for those employed in the exploration, development, and production of offshore resources. Air transportation will be used to bring workers to Nome and then transport them offshore. Those employed from within the Norton Sound region would use air-taxi service; those coming from Fairbanks, Anchorage, or the lower 48 states would use either scheduled or charter jet service into Nome. Helicopters would be the primary mode for transporting workers offshore. Runway improvements to the Nome city airport are not necessary to handle forecast OCS air traffic; however, additional terminal capacity, baggage and lobby areas would have to be constructed as well as the expansion of aircraft parking space.

In regard to surface transportation, use of the road between the Nome airport and Cape Nome would increase substantially. However, improvements in the subject road to handle this projected traffic have been funded for 1985.

CONCLUSION: Vessel and aircraft congestion caused by the proposal is expected to have only a low impact on local transportation systems.

CUMULATIVE IMPACTS: The proposal could mark the third sale within the subject area that, taken in concert with infractructure remaining from previous action, i.e. terminal pipelines etc., it is doubtful that the proposed action would have a significant effect.

CONCLUSION: Cumulative impacts would be low.

(g) Impact on military uses

This is not a subject discussed for the Alaska OCS Planning Areas as there are no restricted areas.

(h) Impact on subsistence-use patterns

One spill of 1,000 barrels or greater would be expected. The Nome/Cape Nome area could experience the bulk of disturbance effects, although St. Lawrence Island and, to a lesser degree, the Yukon Delta region may experience them intermittently.

Subsistence activities of the residents of the Nome area would be interfered with at a very low level because the proposal would result in only incremental additions to the activity already present. Effects in the Delta area would be very low and low on St. Lawrence Island due to tankering.

Low effects of competition and trespass would be concentrated in areas with road access from Nome and, to a lesser extent, at Unalakleet.

The effects of the proposal upon subsistence use of resources in Nome subsistence areas occur primarily in waters of Norton Sound where marine traffic is concentrated and oil spill risks (1 spill over 1,000 barrels expected) are higher. Riverine subsistence areas may be affected to a lesser extent by nonresident sports hunters as a result of competition for resources, perceptions by residents of habitat being despoiled, and increased regulatory oversight.

This planning area relies heavily on a few species to meet subsistence needs (salmon, sea mammals, caribou, birds). In addition, an oil spill reaching the Yukon Delta could lead to long-term effects. Residents could be forced to relocate subsistence activities, which would add to the cost and time of obtaining the resources, increase conflicts with subsistence hunters already using the areas, and possibly lead to a reduction in the amount taken. Platforms constructed (one in 35 years) in blocks closest to the Delta could displace (remotely) hunters of beluga whales and seals. Because the potential for oil reaching the Delta is very low, risks to subsistence in the Yukon Delta are considered low.

Potential negative effects to subsistence were identified for the Inner Norton Sound area, especially spill-over effects as residents go to Nome for jobs or nonresidents use subsistence areas for sport hunting. However, the region has a very low potential for being affected by oil spills, and the effects of the proposal are likely to be low. Around St. Lawrence Island, oil spills and oil development could lead to moderate effects on subsistence. This is attributed primarily to the reliance on large sea mammals for subsistence. Displacement of mammals, area closures to protect oil related facilities, or oil spills could affect the subsistence pursuits of the St. Lawrence Islanders.

CONCLUSION: The subsistence impact for both the Nome/Cape Nome and St. Lawrence Island regions is likely to be moderate. In inner Norton Sound and on the Yukon Delta, the subsistence effect of the proposal is likely to be low.

CUMULATIVE IMPACTS: Tankering of crude from previously leased Federal acreage to a major oil terminal on the Alaska Peninsula or directly south to market could increase the threat of disturbance, interference, and oil spills on the subsistence resources used by the residents of the planning area. Increased traffic and oil spill risks (2 spills expected) are concentrated in the Norton Sound/Safety Lagoon area and, to a lesser extent, around St. Lawrence Island.

CONCLUSION: In the cumulative case, subsistence effects in both the Norton Sound/Safety Lagoon and St. Lawrence Island regions may be moderate. The effects may be moderate in inner Norton Sound and in the Delta.

(i) Impact on sociocultural systems

The social system also includes the organization of task groups that carry out subsistence-related activities as well as the traditional forms of consuming, sharing, and bartering subsistence goods. The functional relationships between the organization of subsistence production and of consumption are described in Section III.C.2 of the Sale 100 FEIS. The sociocultural system includes, as well, the ways in which kinship, leadership, and the learning of role expectations and traditional wisdom are organized. Finally, it includes the complex of cultural values that animate and make meaningful such institutions as the subsistence system, sharing networks, and the kinship system. These values include strong ties to Native foods, to the environment and its wildlife, to the family, to the virtues of sharing the proceeds of the hunt, and to independence from the outside.

Possible effects of oil spills and other sale-related activities on biological resources are discussed elsewhere (see IV.B.). Generally, noise and traffic may displace animals and thereby create local, intermittent disruptions of subsistence activities. Effects from oil spills are less likely, but local damage could be greater and longer lived, lasting up to 1 year. All effects are expected to be concentrated in, but not limited to, the Nome area. A year-long effect on an important subsistence resource may cause hardship to a community and may disrupt sharing networks and subsistence task groups. However, a year-long disruption probably would not lead to a tendency to replace the sharing networks and task groups which exist with other social institutions. (Natural fluctuations in the distribution and abundance of species have always occurred.) Disruptions to the subsistence systems are not expected to last more than 1 year, and their effects to the sharing networks and subsistence task groups are likely to be small and intermittent. On the other hand, tensions and anxieties caused by the disruptions may occur at high levels. There is, however, only 1 spill over 1,000 barrels expected from the proposal, making this a highly unlikely possibility.

CONCLUSION: Further sociocultural effects beyond those associated with lease Sale 57 and proposed Sale 100 are expected to be low.

CUMULATIVE IMPACTS: Most of the cumulative impacts projected for the Norton region are centered at Cape Nome, where tankering from Nome, oil and gas exploration and development servicing and transportation to and from the rigs could take place. In addition to the proposal, other ongoing or planned projects in the Norton Basin area may have important sociocultural effects. OCS Lease Sale 57 and proposed OCS lease Sale 100 are major projects.

Cumulative changes may have a significant effect on Nome's stratification, interethnic tensions, kin groups, task groups, and sharing networks (see the Sale 57 FEIS, USDOI, BLM, 1982b). It may also affect subsistence by increasing harvest pressure.

Subsistence activities are a primary means by which family traditions, village cohesion, and socio-religious values are maintained and transmitted. The protection of these activities is a primary concern of most inhabitants of the region as well as a primary goal of a majority of the area's present-day political institutions. Cumulative effects on subsistence in the Norton Sound/Safety Lagoon and St. Lawrence Island areas are likely to be high. Cumulative effects on subsistence in inner Norton Sound and in the Delta are likely to be moderate but could be high in the unlikely event of a large oil spill occurring and contacting one of these areas. Added to these direct effects on subsistence are problems of increased competition by sports hunters and fishermen and growing pressures for fish and game regulations. Finally, the concerns about damage to the subsistence system are a major issue.

CONCLUSION: Because of the cumulative effects on subsistence and the importance of subsistence to the region's political and economic systems, because of increased population and traffic that will be concentrated in Nome but will radiate out into other parts of the study area, and because of increased pressures on the region's political institutions, the cumulative effects on sociocultural systems may be high.

b. Unavoidable Adverse Impacts

Section IV.B.11.b. presents a discussion of the unavoidable adverse impacts of the proposal for all Alaskan Planning Areas.

c. Relationship Between Short-term Uses of the Environment and the Maintenance and Enhancement of Long-term Productivity

Section IV.B.11.c. presents a discussion of the relationship between short-term uses of the environment and the maintenance and enhancement of long-term productivity attendant to the proposal for all Alaskan Planning Areas.

d. Irreversible and Irretrievable Commitment of Resources

Section IV.B.11.d. presents a discussion of the irreversible and irretrievable commitment of resources attendent to the proposal for all

Alaskan Planning Areas.

e. Impacts of a High Case Scenario

This section provides a discussion of the potential environmental impacts that could occur in the unlikely event that all unleased, undiscovered, economically recoverable hydrocarbon resources in the Norton Planning Area are leased and developed as a result of the proposal. The estimated "High Case" hydrocarbon resources for the Norton Planning Area are: 130 million barrels of oil and 590 billion cubic feet of gas. These estimates are higher than the "Base Case" for the proposal. However, infrastructure expected to be used to explore and develop these resources includes 10 exploration and delineation wells, 23 development wells and 1 platform. This is not significantly different from the proposal (10 exploration and delineation wells 18 development wells and 1 platform). In addition, the estimated number of oil spills greater than 1,000 barrels remains at one the same as the base case proposal.

It is important to point out that the Norton area does not have existing offshore development. Resource estimates and infrastructure for the high case are the same as the cumulative case. However, the high case assumes that the resource will be developed as a result of the lease sales proposed in this 5-year program, while the cumulative case assumes that leasing and development will extend over future 5-year programs' lease sales.

Impacts to all the resource categories analyzed may increase slightly, however, the significant differences in impacts cannot be differentiated from those described for the base case for Alternative I because of the relatively small amount of change in oil and gas resources, and facilities needed to explore for, develop and produce them.

f. Impacts of Alternative II - Subarea Deferrals

This alternative evaluates the possible deferral of 13 subareas. These areas are in addition to the 14 subarea deferrals under Alternative I. None of the additional subarea deferrals included in Alternative II are within this planning area. Therefore, the expected environmental impacts of Alternative II in this planning area are identical to the expected impacts of the proposal.

g. Impacts of alternative III - Add a Sale in the Straits of Florida

Adding a sale in the Straits of Florida will not affect this planning area. However, under Alternative III all sales proposed in Alternative I - the proposal, would be held. Therefore, the expected impacts of Alternative III are identical to Alternative I for this planning area.

h. Alternative IV - Biennial Leasing

This alternative would include 2 sales (rather than one as in the proposed action) in the Norton Basin Planning Area. This alternative increases oil reserves from 102 MMbbls (proposal) to 122 MMbbls, gas reserves from 470 BCF (proposal) to 559 BCF. Another change is that it is estimated that it will take 3 more wells (21 instead of the proposal's 18) to produce the additional hydrocarbons.

(3) Physical Environment

(a) Impact on water quality

Resource estimates for the Norton Planning Area have not changed significantly by changing the number of sales or the sale data for the planning area. Water quality impacting activities remain at essentially the same level as the proposal.

CONCLUSION: Effects would be the same as the proposal.

(b) Impact on air quality

Resource estimates for Norton Planning Area have not changed significantly by changing the number and timing of sales for the planning area. There are still only 10 exploration wells and 1 production platform envisioned.

CONCLUSION: Effects would be the same as the proposal.

(4) Biological Environment

(a) Impact on plankton and benthos

The effect of one additional lease offering in the Norton area over the proposal period will be the same as the effect of the proposal because resource estimates and therefore impacting causes have not changed significantly from the proposal.

CONCLUSION: Effects on planktonic and benthic organisms are generally expected to be low.

(b) Impact on fish resources

The effect of one additional lease offerings in the Norton area over the proposal period will be the same as the proposal. Three more production wells will not add enough muds, cuttings and formation water to the fish habitat to change impact levels from those of the proposal. It is anticipated that there will be 1 spill over the life of the alternative, the same as the proposal. Therefore impact levels on fish should remain the same as the proposal.

CONCLUSION: One additional lease offering in the Norton Basin is expected to have a moderate effect on fishes.

(c) Impact on marine mammals

The one potential oil spill over 1,000 barrels, and noise and disturbance effects on marine mammals in the Norton Basin Planning Area could increase somewhat with the proposal by the addition of another lease sale for the planning area on the 5-year schedule. The number of oil spills associated with OCS activities in the planning area does not increase and therefore the population effect (local or regional) on walruses and ice seals probably would not exceed moderate while spill effects on polar bears would probably remain low and effects on nonendangered whales would likely be very low (see Section IV.B.18.a.(4) for effects of oil spills). Noise and disturbance effects from air and marine traffic are not assumed to be at higher levels of exploration (10 wells, same as proposal) or higher development (1 production platform, same as the proposal) under this alterntive. However, the increase in frequency of air and vessel traffic disturbance of marine mammals, particularly hauled-out walruses and spotted seals, is not expected to have more than a low impact on the local or regional populations (see discussion in Section IV.B.8.a.(4), impacts of the proposal).

CONCLUSION: The two OCS oil and gas lease sale proposals under this alternative for the Norton Basin Planning Area are likely to have no more than moderate impacts on walruses or ice seals with probably low effects on polar bears and very low effects on nonendangered cetaceans.

(d) Impact on coastal and marine birds

The pontential adverse effect of proposed exploration and production activities on coastal and marine birds in the Norton Planning Area are the same as those already discussed for the proposal.

CONCLUSION: Because resource levels are not significantly different from the proposal, impact levels will approximate those of the proposal.

(e) Impact on endangered species

This alternative would add one more sale to the proposal and resource estimates will increase to 122 MMbbls from 102 MMbbls for the proposal. The increase in resource estimates will not increase the number of platforms; therefore, noise disturbance will be very similar to that described in the proposal. This increase will only slightly increase the probability of an oil spill occurrence.

CONCLUSION: Effects will be the same as the proposal.

(f) Impact on estuaries and wetlands

These topics are discussed and impacts analyzed where they occur as habitat for the fish and wildlife species in (4)(a) through (4)(f) in this section.

(g) Impact on areas of special concern

These areas are all habitat for the fish and wildlife species in (4)(a) through (4)(f) and impacts are discussed as they occur in the planning areas.

(h) Impact on Marine Sanctuaries

There are no marine sanctuaries in the Alaska OCS Region.

(5) Socioeconomic Environment

(a) Impact on employment and demographic conditions

Moving up the first sale by 1 year and adding a second sale would marginally increase the risk of impacts on employment and demographic conditions.

Exploratory activity will not increase because of this alternative. Production activity will inrease by 3 wells, although from only the one platform estimated for the proposal. Presently employed workers will probably end up being employed longer rather than more workers hired. Employment and therefore induced population will remain essentially the same as the proposal. Therefore impacting factors will be the same as the proposal.

CONCLUSION: The effect caused by population increase in Nome would be moderate. The effect on the economy of the City of Nome is expected to be moderate.

(b) Impact on coastal land use

Under this alternative a second sale would be held in the planning area over the life of the proposed 5-year schedule. However, the resource estimates for the planning area have not appreciably changed; thus, the ultimate impacts of the OCS sales proposed by this alternative would not be different from those forecast for the proposed action.

CONCLUSION: The impact of this alternative would not differ from that of the proposed action, which was low.

(c) Impact on commercial fisheries

The effects of the proposal on commercial fisheries are low. Exploratory activity will not increase because of this alternative. Production activity will increase by 3 wells, however the number of platforms (1) does not change. The number of spills over 1,000 barrels remains the same (1) as the proposal. There will be some increases in drill muds, cuttings and formation waters because it is estimated that 3 more production wells will be drilled. This increase is not enough to raise impact levels. Onshore facilities remain the same as the proposal. Therefore, the effect of an additional lease sale in this area should not significantly increase the risk to the commercial fisheries.

CONCLUSION: Effects on the commercial fisheries in the Norton Basin Planning Area would be low.

(d) Impact on recreation and tourism

Moving the proposed sale of year 1989 or 1990 up 1 year would concentrate effects toward the beginning of the schedule. Adding a sale does not raise the level of activity significantly, therefore the effects of the proposal remain low.

CONCLUSION: Impact levels would be low.

(e) Impact on archaeological resources

By moving the proposed sale of year 1989 or 1990 up 1 year, effects will be concentrated toward the front of the schedule. Adding a sale does not raise the level of activity significantly, therefore the effects of the proposal remain low.

CONCLUSION: Impact levels remain low.

(f) Impact on subsistence-use patterns

Moving up the first sale by 1 year and adding a second sale would marginally increase the risk of negative effects on subsistence because the overall level of employment, spill rates, and activity does not increase significantly.

CONCLUSION: The overall effect on subsistence in the planning area would be moderate in the Nome/Cape Nome and St. Lawrence Island regions. In inner Norton Sound and on the Yukon Delta the effects would be low.

(g) Impact on sociocultural systems

Increasing to two the number of sales in the 5-year period would accelerate the sociocultural changes already occurring there and could add stress to already vulnerable social systems in the area. The Nome area would no doubt experience most of the increased effects, given its role as port and airport. However, overall population and activity levels would be essentially the same as the proposal.

CONCLUSION: Sociocultural effects are expected to be high.

(h) Impact on tranportation systems

Under this alternative a second sale would be held in the planning area over the life of the proposed 5-year schedule. However, resource estimates for the planning area have not appreciably changed; thus, the impacts of the OCS sales proposed by this alternative would not be different from those forecast for the proposed action.

CONCLUSION: The impacts of this alternative would not differ from that of the proposed action.

(i) Impact on military uses

This is not a subject discussed in the Alaska OCS Region as there are no restricted areas.

i. Alternative V - Acceleration Provision

This alternative would schedule the one sale to be held in this planning area in 1988 rather than in 1989 as in the proposed action. No new sales would be added, nor would the presale environmental analysis and planning process be foreshortened. Therefore, impacts of this alternative in the Norton Planning Area would be the same as in Alternative I.

j. Impacts of Alternative VI - Defer Leasing in Six Planning Areas: North Atlantic, Washington and Oregon, Northern California, Central California, Southern California, and North Aleutian Basin

Selection of Alternative VI would defer leasing in the six planning areas, only one of which, North Aleutian Basin, is in the Alaska Region. Therefore, the impacts resulting from this alternative would be the same as described for Alternative I (the proposal).

k. Impacts of Alternative VII - No Action

Under this alternative, the Secretary of the Interior would propose not to schedule any oil and gas lease sales for this proposed 5-year program. All potential impacts from OCS oil and gas activities to the physical, biological, and socioeconomic environment resulting from hydrocarbon exploration, development, and production would be eliminated.

Oil and gas are currently the nation's primary energy source. Even with a vigorous conservation program the United States' demand for energy will continue to grow. With the adoption of Alternative VII, the oil and gas that would have been available as a result of this proposed program would no longer contribute to the national domestic production during the life of the program.

With the removal of the potential oil and gas into the national energy reserves, it would necessitate the increased production of energy from other conventional and non-conventional energy sources (See Appendix C), and/or increases in import levels from foreign sources. Impacts resulting from the development of the alternative energy sources are summarized in Section II.A.7 and discussed further in Appendix C.

19. Hope Basin

a. Alternative I

The proposal includes the holding of one sale in the Hope Basin Planning Area. It is estimated that the sale will produce about 145 MMbbls and 1,539 billion cubic feet of gas over a 35 year period. These resources will be produced from 40 production wells from 1 platform. In addition to the oil and gas, about 5 to 250 MMbbls of formation water will be produced. Approximately 172 thousand barrels of drilling muds and fluids and 119 thousand barrels of drill cuttings could be discharged into the sea over the life of the proposal. About 13 exploration wells will be drilled. It is anticipated that 1 support base will be expanded and that at least 1 onshore facility will be expanded. For a generic discussion of impacts, see Section IV.B.11.(3), (4) and (5).

(1) Interrelationships of Proposal with Other Projects and Proposals

Section IV.B.11.a.(1) presents a discussion of the interrelationships of the proposal with other projects and proposals, for all Alaskan planning areas.

(2) Projects Considered in Cumulative Impact Assessment

Section IV.B.21.a.(2) presents a discussion of the regional projects considered in the cumulative impact assessment for this planning area.

(3) Physical Environment

(a) Impact on water quality

In the Hope Basin, anchoring of one exploration or production platform and entrenchment of a pipeline would increase turbidity only temporarily over a limited area. The discharge of an estimated 250 million bbls of formation waters, 172,000 bbls of drilling muds, and 119,000 bbls of drill cuttings may result from the proposed action. These discharges could result in high impacts within a few meters of the discharge site; however, these will decrease to low with distance (1 km) from the source. Production, but not exploration, discharges would continue intermittently over several years. One oil spill of 1,000 barrels or greater could significantly, but temporarily, increase water-column-hydrocarbon concentrations over several hundred kilometers.

CONCLUSION: Impacts on water quality from the proposal would be low.

CUMULATIVE IMPACTS: Cumulative effects would include those from the proposal plus those arising from existing lease sales. These include potential tankering of oil from Prudhoe Bay and potential tankering of Canadian crude through the area. An oil spill would significantly, but temporarily, degrade water quality in the area. Overall, oil pollution is not expected to increase from that for the proposal alone, but no other effects on water quality would be greater than for the proposal due to the timing of the particular sales, their production/construction schedules, and the duration of anticipated effects. Significant long-term effects on regional water quality would still be very unlikely.

CONCLUSION: Low water quality effects would occur through short- and long-term local degradation.

(b) Impact on air quality

In the Hope Basin, effects on air quality from the proposal are expected to be low, based on projected emissions of offshore exploration and production activities, and potential onshore facilities in an area of pristine air quality. Projected peak emissions would not exceed State or Federal air quality limitations unless concentrated nearshore in a small area. In that event, existing control technology would ensure attainment of standards, although air quality would not be absolutely pristine near the one facility. Onshore emissions also would be subject to Federal PSD review and modeling.

CONCLUSION: Direct effects on air quality from activities of the proposal would be low.

CUMULATIVE IMPACTS: Cumulative impacts of offshore emissions also are expected to be low as a result of the proposal. The production-related emissions could exceed Department of the Interior air quality analysis exemption levels for all pollutants if the operation was located approximately 5 kilometers (3 miles) offshore. This is highly unlikely because industry interest is usually much farther offshore.

Cumulative air quality impacts could be seen in Cape Krusenstern as a result of facilities. Any facility would have to meet all Federal and State air quality standards and; Class II PSD standards and, control technology would be required.

Again, because an oil-storage and marine-loading terminal would be required to meet State and Federal ambient air quality and Class II PSD limitations, no unavoidable effects on air quality are foreseen.

CONCLUSION: Cumulative impacts of the proposal on air quality would be low.

(4) Biological Environment

(a) Impact on plankton and benthos

Planktonic and benthic resources of greatest concern in the Hope Planning area and Kotzebue Sound are: (1) the linkage between primary producers and zooplankton consumers; (2) amphipods, which are an important food of migrating, endangered gray whales; and (3) crabs, which are harvested for subsistence purposes. Other benthic invertebrates, such as echinoderms, bivalves, and the gastropod mollusk, *Neptunea*, derive importance from their abundance and trophic interactions.

Marine plants and invertebrates have lifespans ranging from a few days to tens of years. Organisms with short lifespans relative to the scale of the disturbance (whether it be an oil spill or construction activities) are very likely to show effects. An oil spill is more likely to cause widespread negative effects on marine plants and invertebrates than are other activities associated with exploration, development, and production of oil and gas resources. There is a 31 percent probability of 1 spill of 1,000 bbls or more estimated for this area.

Crabs would be most vulnerable to oil spills during the spring and summer as planktonic larvae. Since egg release, molting, and mating occur about the same time and multiple-age classes are present, an oil spill occurring at this time could affect population numbers for several generations. Amphipods, an important food for migrating gray whales, are very sensitive to oil and could suffer effects if a large portion of the regional population were killed and/or recruitment into oil-contaminated areas were greatly reduced. For both crabs and amphipods, effects are likely. Planktonic organisms, whose lifespans range from about 1 week to 1 year, are, generally, expected to be affected little by oil and gas-related activities; the short-lived species and those for whom reproduction or recruitment are affected show some effects. For other abundant invertebrates, effects are expected to be small, since most of these organisms have broad distributions as adults and/or larvae.

Effects from other activities (seismic exploration; discharge of drilling fluids (172,000 bbls), cuttings (119,000 bbls), and formation waters (5 to 250 MMbbls); and construction activities) should be very localized. Effects from these activities should be small, with the exception of construction activities, which should have effects on sedentary benthic invertebrates due to the long-term (relative to the generation times of these organisms), localized changes caused by installation of a pipeline, a platform, etc.

CONCLUSION: Effects on planktonic and benthic organisms are generally expected to be low.

CUMULATIVE IMPACTS: In the Hope Basin area, cumulative impacts due to development of potential resources will come mainly from activities associated with oil and gas development.

Activities associated with offshore oil and gas sales that are likely to affect marine plants and invertebrates and that increase under the cumulative case are drilling of exploration, delineation, production, and service wells; construction of the production platform; and installation of the pipeline to carry oil and gas.

Considering the relative volumes involved, the low toxicity of drilling fluids to marine organisms, and the anticipated localized effects, discharges of drilling fluids (172,000 bbls) and cuttings (119,000 bbls) should have little effect on marine plants and invertebrates in the Hope

Basin area.

Under the cumulative case, there is a 42 percent probability of one oil spill occurring (the same number of spills as the proposal). Although the probability of an oil spill does increase in the cumulative case, effects on plankton are not expected to be significant; for amphipods and crabs, low effects are likely; and for other abundant benthic invertebrates, effects should be low, although moderate effects could result from construction activities.

CONCLUSION: Considered as a group, planktonic and benthic organisms are generally expected to experience low effects.

(b) Impact on fish resources

In general, it is the nearshore zone that contains the highest densities and species diversity of fish in this region, at least during the open-water season. Anadromous and some freshwater fish move into the nearshore in the summer to feed, and return to the rivers in the fall to overwinter and spawn. A few marine species also use this area for feeding, and with minor exceptions, return to the deeper, more offshore regions during and following freezeup to overwinter and spawn. The nearshore zone therefore would be the most sensitive to petroleum-related effects, particularly in those areas that harbor overwintering fish in and near the major river deltas.

Marine species such as arctic and saffron cod, herring, flatfish, sculpin, and capelin are abundant, widespread, and are thought to accomplish their life-history functions (e.g., spawning) over wide areas.

The interaction of oil with fish could produce a variety of lethal and sublethal responses (Rice, 1981; Malins, 1977).

Only low impacts on the fish resources of the Hope Basin area are expected as a result of an oil spill should the proposal be implemented. This is largely due to the low probability of a spill, the broad distribution of fish, and the low concentrations of hydrocarbons associated with oil slicks.

Effects on fish resources from dredging and construction activities would result from suspended sediments, entrainment, and changes in temperature, salinity, and circulation. The effects produced from dredging would be localized and short-term. These effects are considered very low due to the low densities of fish in the area, and their high tolerance to suspended sediments. Changes in temperature, salinity, and circulation from the presence of a single causeway have been shown to affect fish behavior.

The construction of a gravel causeway could provide a potential for adverse effects on regional populations of anadromous fish. Studies of the Prudhoe Bay causeway showed that a deflection of the longshore current offshore was instrumental in altering temperature and salinity around the causeway. With the prevailing northeast winds, temperatures on the west side would be

2 to 4 degrees cooler, while salinities would increase by 10 parts per thousand (Bendock, 1979). Although these differences are well within the range of fluctuations frequently observed in the study area (Craig and Haldorson, 1981), the consistent tendency for these differences might affect fish. Currently, the nature of cumulative causeway effects should be treated as an unknown.

CONCLUSION: Effects on fish resources are not expected to exceed low. Effects on regional populations from the presence of causeways along the coastline are unknown.

CUMULATIVE IMPACTS: Proposed oil and gas leasing could result in cumulative or additional effects on the fish resources of the Hope Basin region. These proposed activities include possible tankering of oil produced from Canada through the planning area. Other development affecting fish resources would include leasing operations by the State of Alaska and development of mines with port facilities. Effects on fisheries from these leasing activities could result from construction activities (road, pipeline, well pad) that would lead to an increase in sediment loads in streams, accidental oil spills that enter lakes or river streams, withdrawal of water from critical fish overwintering sites, and introduction of pollutants (such as drilling fluids or formation waters) into lakes or river streams.

The oil spill probabilities (42 percent) are greater than those of the proposal (31 percent), since an oil spill from proposed Federal leases and from tankering of Canadian oil may occur. However the estimated number of spills (1) remains the same as the proposal.

The effects of an oil spill from proposed Federal OCS leases and Canadian tankering are expected to be low for anadromous and marine fish.

Dredging in state waters could increase the number of sites where effects on fish could occur. Dredging occurring in these nearshore waters would have a higher probability of entraining fish due to the higher densities of fish. However, the mobile nature of most fish species in this region would preclude all but relatively small numbers from being entrained. An exception, the fourhorn sculpin, would be more susceptible due to its low mobility and demersal behavior. This species is numerous and broadly distributed, so dredging effects would be low.

The construction of causeways for development of state leases is also very likely. The presence of a causeway would disrupt temperature, salinity, and circulation patterns, and affect fish movement in this area.

CONCLUSION: Cumulative effects on fish resources are expected to be low.

(c) Impact on marine mammals

Ten species of nonendangered marine mammals--Pacific walrus, ringed, bearded, spotted, and ribbon seals, polar bears, beluga whales, and small numbers of killer and minke whales, and harbor porpoises--commonly occur in a portion of or throughout the Hope Basin Planning Area and are very likely to have some interaction with OCS industrial activities. Oil pollution and disturbance due to increased human activity and alteration of habitats could adversely affect marine mammal populations found in the proposed planning area. The general effects of oil spills, noise and disturbance, and habitat alterations on marine mammals are discussed in Section IV.B.11.a.(4) Impacts on Marine Mammals in the Gulf of Alaska Planning Area.

An estimated 150 Pacific walruses including nearly all nursing females with calves and over 300,000 ringed, spotted, bearded, and ribbon seals that migrate through or summer in the Hope Basin are the marine mammal populations at greatest risk from oil spills that may be associated with the proposal. If an oil spill occured during the spring migration in the Hope Basin a few hundred to a few thousand walruses or perhaps an estimated 100 ice seals could be contaminated; and there could be a possible loss of all contaminated walrus calves and very young seal pups of the affected groups in a severe situation where an oil spill would contaminate major ice leads being used by large numbers of migrating walruses and seals. This loss would represent a low effect on overall walrus and seal populations that occur in the planning area since these losses are likely to be replaced within one or two years.

An oil spill that may occur within open-water and broken-pack-ice areas west of Kotzebue Sound could contaminate a few to perhaps 10 or 20 polar bears in an extreme situation and result in the death of individuals heavily coated with oil. This loss is likely to have a low effect on the polar bear population. The possibility of loss of even 10 or 20 polar bears to an oil spill in the southern Chukchi Sea would be very remote.

Groups of beluga whales and other cetaceans numbering perhaps 10 to a few hundred could surface in oil-contaminated ice leads, and some of these animals could actually contact oil on the surface or in an oil-water emulsion layer covering part of the leads. This brief exposure is likely to have very temporary irritation effects on belugas (see preceding discussion on "Effects of Oil" Section IV.A.4. Most of the oil that contacts a whale's skin is likely to be washed away when the animal dives. Any oil that might adhere to the whales also would be subject to weathering. The most toxic and most harmful hydrocarbons in the oil spill also would be rapidly dispersed by wave and wind action, which could greatly reduce the time of exposure.

No beluga whales or other cetaceans are likely to die from the probably brief exposure to an oil spill. If exposure of the whales to a spill were prolonged due to severe ice conditions that may prevent the whales from moving out of a contaminated lead system, oil contact and inhalation of toxic hydrocarbon fumes could possibly contribute to the death of very weak or diseased individuals through increase in physiological stress. However, oil to which the whales are exposed also would be evaporating and dispersing, thus limiting the degree of exposure. Even in a situation with whales trapped in a contaminated lead, the number of whales severely affected is likely to be very low to low.

An oil spill that may occur during the open-water season is likely to contaminate no more than a few seals or walruses in offshore habitats, while an oil spill that may contact a walrus or spotted seal haulout area may contaminate a few hundred or more animals. However, few, if any, of these adult or juvenile walruses or seals are likely to die as a result. These effects are likely to be very low to low on marine mammal populations. Although oil spills associated with the proposal could have direct effects on some marine mammal food organisms within very local areas near the spill sites, marine mammals in the Hope Basin are opportunistic feeders. They exhibit highly mobile foraging habits and can easily shift from affected local food organisms to unaffected prey and unaffected habitat areas. Even a 100,000 barrel oil spill would not kill sufficient numbers of prey organisms used by marine mammals to measurably reduce the overall food sources of any marine mammal species population above the natural variability in prey populations. Any local reduction in pelagic or epibenthic prey organisms due to any oil spill is likely to be restored by rapid recruitment after the spill has been dispersed. Thus, indirect effects of oil spills on marine mammals are likely to be very low to low.

Traffic from the helicopters and supply vessels assumed to be associated with exploration--as well as seismic boats--would be primary sources of noise and disturbance to marine mammals. The most serious disturbance could come from aircraft flights over walrus nursery herds hauled out on the ice during spring migration. Such disturbance could cause physical injury and death to walrus calves by panic-stricken walrus cows. Disturbance also may cause abandonment of walrus calves by the cows. However, the number of nursery herds of walruses disturbed by aircraft flights is likely to be few and represent low effects.

Seals and beluga whales may be displaced along aircraft or vessel routes--probably with very low effects on the populations. The possibility of oil-tanker trips and LNG-tanker trips to and from Hope Basin each year during oil and gas production may temporarily interrupt the movements of beluga whales, seals, and walruses through the Bering Strait when the vessels pass nearby. However, the level of vessel traffic is unlikely to block or greatly delay marine mammal migrations. Severe ice conditions are likely to have a far greater influence on marine mammal spring and fall migration patterns than vessel traffic associated with the proposal. Tanker traffic is likely to have no more than low effects on marine mammal migration patterns. Overall noise and disturbance effects on marine mammals are not likely to exceed low impact levels.

Dredging, drill-platform construction (production platform), and oil and gas pipelaying and burial could temporarily displace marine mammals and some food sources near these sites during construction activities. Some marine mammals could continue to be disturbed and perhaps migration movements and habitat use could continue to be diverted a few kilometers away from the production platform. However, this displacement is likely to be very small in comparison to the natural variability in habitat use and variability in migration patterns. Thus, noise and disturbance impacts associated with dredging and platform construction and operations--as well as other adverse habitat changes--are likely to be low to very low.

Possible tanker-terminal facilities to be built in the Hope Basin could temporarily disturb and perhaps displace a small number of ringed seals that seasonally inhabit shorefast ice near the site. However, this displacement would have no more than a low effect on the local seal population.

CONCLUSION: The combined effects on nonendangered marine mammals of oil spills, noise and disturbance, and adverse habitat changes associated with the proposal are likely to be low.

CUMULATIVE IMPACTS: The additive effects of other ongoing and planned projects, as well as the proposal, on nonendangered marine mammals are discussed in this section. Although the probability of any or all planned and ongoing projects reaching developmental stages is generally unknown, this analysis assumes that all the following projects reach developmental stages. These projects could affect marine mammals through oil spills, noise and disturbance, and habitat alteration. Cumulative OCS oil and gas activities and possible Canadian tankering in the Chukchi Sea-Hope Basin and/or carrier traffic from onshore mining activities would subject marine mammals to a variety of aggregate effects.

Potential oil spills from OCS leases and transportation of oil and LNG could have the most effects on marine mammals, particularly if large numbers (several thousand) of walruses and ice seals were contaminated by a spill occurring within or contacting leads or polynyas west of Kotzebue Sound and in the Bering Strait when large numbers of walrus cows and calves were present, or when sizable numbers of ringed, spotted, and bearded seals were migrating through the lead systems. If several thousand walruses and a smaller number of ice seals were contaminated, several walrus calves, some ice seal pups, and perhaps small numbers of highly stressed adult animals could be killed. These losses are likely to represent low to moderate effects on regional marine mammal populations if losses took up to one generation to replace.

Cumulative effects of oil spills (one estimated for the cumulative case) in Kotzebue Sound, particularly near the possible tanker terminal in the Hope Basin, could result in the loss of small numbers of ringed seal pups and sublethal effects on perhaps a few hundred spotted seals or adult walruses (low population effects). Local and short-term reductions in the availability of food organisms due to the cumulative oil spill (see Section IV.A.4.) are likely to have low effects on marine mammal populations.

Cumulative increases in aircraft and vessel traffic associated with OCS oil-and-gas development and transportation, and ore-carrier traffic from potential onshore mining activities at the Red Dog mine, would be the primary noise and disturbance sources of marine mammals in the Hope Basin, Bering Strait, and other habitats in the Chukchi Sea. Low-flying aircraft are likely to cause the most apparent effects, with direct injury or death of walrus calves or seal pups if walrus and seals dive panic-stricken into the water. Repeated aircraft disturbance of walrus nursery herds could significantly reduce calf survival, while repeated disturbance of adult male walruses and spotted seals could cause the abandonment of traditional haul out sites. The abandonment of local haul out sites may last for one generation and could represent moderate effects on a species population.

If oil and gas production takes place on both future Chukchi Sea OCS sales, and proposed Hope Basin sales, more than 100 oil-tanker and LNG-tanker passages per year could occur through the Hope Basin. This cumulative increase in vessel traffic with added supply-boat and seismic-vessel activity, and perhaps several ore-carrier trips per year from the potential Red Dog onshore mining project, could disturb walruses, seals, and whales as the vessels pass nearby, causing the animals to temporarily leave the area. This displacement is likely to be short-term and represent no more than low effects on marine mammal distributions.

CONCLUSION: Cumulative OCS oil and gas activities in the Hope Basin--and possible ore-carrier traffic from the onshore mining project probably would have a combined moderate effect on nonendangered marine mammal populations in the Hope Basin.

(d) Impact on coastal and marine birds

The effects of an oil spill on birds in the Hope Basin area would vary with the season; volume, nature, and duration of the spill; species and numbers of birds occurring in the areas affected; and many other factors. A spill that occurs during the winter would have no immediate effects on most birds, with the exception of overwintering black guillemots in ice leads and polynyas. However, oil that remains in the ice after winter cleanup efforts may directly affect birds during the following spring breakup period or indirectly affect them through changes or reductions in food source availability.

An oil spill that occurs or melts out during spring breakup or during the open-water period are likely to have immediate effects on some birds. Species most likely to suffer direct mortality would be alcids, particularly murres, puffins, sea ducks (specifically oldsquaw, and eiders), and loons. Depending on the timing and areas contacted by the spill, other birds such as phalaropes, brants, and other waterfowl may also be directly contaminated by oil that contacts leads in the ice during spring, or coastal marshes or lagoons during the summer-fall feeding periods. Migratory waterfowl and shorebirds may be affected if an oil spill reaches coastal habitats along Kotzebue Sound or within Ikpek Lagoon and Shishmaref Inlet. In the above cases, several hundred to several thousand birds may be directly killed. Birds that are more likely to avoid direct mortality from an oil spill, such as gulls and terns, or other birds that may survive partial oiling, could incur various pathological effects from oil ingestion and reduced productivity from egg or chick mortality or displacement from local habitats.

The impacts of an oil spill (1 over 1,000 barrels estimated) on most species of marine and coastal birds are likely to be low because of the rapid recruitment of birds from adjacent areas. However, species that are highly vulnerable to oil spills, such as murres and other alcids, could suffer moderate effects on regional populations because of their low reproductive rates. Adverse effects incurred due to loss of available food sources are likely to be very low near the spill site and last for one season or less. However, oil contamination of sensitive habitats such as salt marshes may have long-term effects lasting several years. If major portions of coastal salt marshes were severely contaminated, such an event could affect several thousand birds and would be considered a moderate effect.

Low-flying aircraft could cause disturbance of bird feeding, molting, and nesting concentrations along the coast. Disturbance of large flocks of molting and feeding waterfowl and shore birds in the Ikpek Lagoon, Shishmaref Inlet, and Kotzebue Sound may result in higher migration mortality and lower winter survival of affected birds, particularly loons and cranes. However, only infrequent aircraft disturbance is expected and therefore is likely to result in low effects. Vessel traffic disturbance of birds is likely to be brief with short-term diving and flight reactions by the birds. This disturbance is likely to have no measurable effect on the well-being of birds involved. However, vessel traffic that moves through lagoons and other coastal-concentration areas could have moderate effects.

Offshore and onshore construction and development are likely to temporarily disturb and displace some birds from local habitat areas, which would be altered by these activities. Dredging, pipelaying, and platform construction would have local short-term or low effects on birds.

CONCLUSION: The impacts of oil and gas development on marine and coastal birds are likely to be low.

CUMULATIVE IMPACTS: Oil and gas activities in the Hope Basin and adjacent onshore areas would subject marine and coastal birds and their habitats to a variety of aggregate effects. Potential cumulative oil spills from Federal and State leasing activities, and possible Canadian tankering would subject bird populations and habitats in the Kotzebue Sound, Ikpek Lagoon, and Shishmaref Inlet areas to higher oil-spill risk (although only 1 spill is anticipated) and potentially moderate oil-spill effects. Eiders, oldsquaw, murres, puffins, and phalaropes are the species groups most likely to be adversely affected by cumulative oil pollution. High effects are possible from the combination of potential oil spills (one assumed), disturbance, and habitat alterations. However cumulative spill rate, infrastructure, and exploratory activities are not much higher or the same as the proposal.

CONCLUSION: Cumulative oil and gas exploration, development, and production could have moderate impacts on marine and coastal bird populations.

(e) Impact on Endangered and Threatened Species

Four endangered whale species pass through this planning area--bowhead, gray, fin, and humpback. The endangered Eskimo curlew historically was common but no longer is seen. The threatened arctic peregrine falcon is known to nest on the Seward Peninsula, which forms the southern boundary of the planning area. There are no listed plant species in areas adjacent to the planning area. Refer to Section IV.B.11.a.(4) in this document for details on effects on endangered and threatened species that may occur as a result of oil and gas activities associated with the proposal.

There is a two percent marginal probability of discovering the 145 Mbbls of oil speculated to be in the planning area. It is expected that up to 13 exploratory/delination wells and up to 40 development/production wells will be drilled from one platform. One oil spill is assumed to be associated with the discovery and production of the resource level, the one spill being 1,000 bbls or larger. Oil will be piped to a landfall base in the vicinity of Cape Krusenstern possibly the same port area that could be developed for the Red Dog Mine. The oil will then be piped overland to join the existing TAPS.

Noise associated with the proposal at times may not exceed the ambient levels that are found during breakup. Most noise-producing activities will be associated with the pipeline and infrastructure construction.

Bowheads will be traveling through the area primarily during the spring months. Occasionally during the fall migration they will occur in areas other than the Bering Strait. Gray, fin, and humpback whales are likely to be in the area during the summer feeding months. Death of prey or displacement from feeding or migrating areas could occur due to activities associated with the proposal. Peregrines could be displaced from nesting areas due to noise disturbance or by lack of prey species.

CONCLUSION: Effects on endangered species are expected to be low from activities associated with the proposal.

CUMULATIVE IMPACTS: Cumulative impacts will result from the installation of platforms and support traffic in several planning areas along the whale's migratory routes or in summer feeding areas. Long-term ensonification of areas could result in displacement of whales, although there is some possibility that habituation to the noise levels could occur. Death of prey will affect summering whales more than the bowhead, which seldom feeds during the spring migration. Displacement of peregrines from nest areas would result in the loss of several year-classes because other nest areas may occur only outside the planning area vicinity.

CONCLUSION: Effects on endangered species due to long-term effects from oil and gas activities are not expected to exceed low.

(f) Impact on estuaries and wetlands

These topics are discussed and impacts analyzed where they occur as habitat for the fish and wildlife species in (4)(a) through (4)(f) in this section.

(g) Impact on areas of special concern

These areas are all habitat for the fish and wildlife species in (4)(a) through (4)(f) and impacts are discussed as they occur in the planning areas.

(h) Impact on marine sanctuaries

There are no marine sanctuaries in the Alaska OCS Region.

(5) Socioeconomic Environment

(a) Impact on employment and demographic conditions

The pipeline landfall will most likely be located in the vicinity of Cape Krusenstern and travel overland to connect with the TAPS. Air and marine support bases will both be in Kotzebue.

Most petroleum workers in the areas would live in isolated enclaves during work periods, and would commute during frequent rest periods to permanent residences in other regions of Alaska or outside the state. Most in-State commuters would reside in the Anchorage region. The long-term employment impact resulting from the proposal for development of the planning area including all indirect employment effects, would total about 100 jobs statewide, and the population impact would be about 200 new residents.

CONCLUSION: The level of expected effects would be low.

CUMULATIVE IMPACTS: In the unlikely event that the entire Hope Basin planning area is leased and all resources subsequently are developed over the life of the proposal, the total cumulative impacts on resident employment and population in the adjacent land area (Kobuk census division) would peak between 2002 and 2006, however, only minor short-term stresses would be imposed on public and private services and facilities. These cumulative impacts include all anticipated non-OCS activities, onshore and offshore, as well as all OCS activities in this planning area or in other planning areas, that are expected to have employment or population effects in the land area adjacent to the Hope Basin OCS Planning Area.

Anticipated OCS activities in this planning area, either at the mean expected resource development level or in the unlikely event of total development of all area resources, are not expected to have significant employment or population impacts in the land area adjacent to the Hope Basin planning area. The lack of significant employment or population effects is due in part to the relatively low resource estimates for the area. In addition, most petroleum workers in the area would live in isolated enclaves during work periods, and would commute during rest periods to permanent residences in other regions of Alaska or outside the State. Most in-state commuters would reside in south central Alaska, which is many hundreds of miles from the Hope Basin Planning Area. The direct and indirect employment effects in Anchorage, resulting from Hope Basin OCS activities, could total 100 additional jobs, and the population effects in Anchorage could be 200 additional residents. These minimal effects on the Anchorage area are estimates that apply to the mean expected or total resource development in the Hope Basin area because there is such a small difference in activity.

CONCLUSION: The contribution of the proposal to the resident employment and population effects would be low.

(b) Impact on coastal land uses

This introduction of OCS activities and related infrastructure would mark a new type of land use for the Kotzebue Sound region. An oil support base, storage areas, and a petroleum pipeline would cause an increase in primary uses for certain areas. Much of the subject region is held as National Parks or Preserves and substantive portions are also deemed by native groups as being essential to their subsistence lifestyle. The construction of an extensive linear structure, a pipeline would require land exchanges between State, Federal and Native groups as well as alter the subsistence based use of some locations.

CONCLUSION: The effects of this proposal could be moderate.

CUMULATIVE IMPACTS: This proposal would be one of two major projects forecast for the Kotzebue Sound region. Currently land exchanges are being negotiated between the State and the Federal Governments which would allow the development of a mining complex north of the Cape Krusenstern National Monument. At this point it is unknown whether a pipeline could share the right of which may be allocated to the mining concerns. Thus, it must be assumed that the projects would be mutually exclusive and as such the cumulative effects of this proposal would be essentially the same as for the non-cumulative case.

CONCLUSION: Cumulative impacts could be moderate.

(c) Impact on commercial fisheries

The Hope Basin commercial salmon fishery, existing primarily in Kotzebue Sound, is a minor fishery when compared to the other salmon fisheries of western Alaska. Less than 0.2 percent of the total Alaska landings are made in this area. However, the commercial fishery is a major source of income to the people of the region.

Impacts on the commercial fishery of Kotzebue Sound are likely to result from ocean space use conflicts (damage/loss to gear and disruption of fishing activities due to oil spills) and loss of fish resources. These types of impacts have been discussed thoroughly in previous sections.

Since the expected level of OCS activity in this planning area is extremely low, impacts to commercial fishing from space use conflicts would be very low. Furtner, since ecological losses are expected to be very low, loss of harvestable resources (salmon) is expected to be very low.

CONCLUSION: As a result of the proposal, the expected level of impact on commercial fishing in the Hope Basin Planning Area would be very low.

CUMULATIVE IMPACTS: Cumulative impacts would result from full development of resources within the planning area, tankering of oil from the proposed

Barrow Arch leases and the Canadian Beaufort, and the proposed State sale in Hope Basin. The contribution of the proposal, whether total development of hydrocarbon resources on the area is considered or not, is small.

CONCLUSION: Cumulative impacts for this area are assessed to be low.

(d) Impact on recreation and tourism

Most effects on recreation and tourism would be changes in economic values and noneconomic qualities. Changes in the number of users, property values, and visual qualities are examples.

There have been no detailed studies in this planning area because there have been no previously proposed sales. There would be changes in wilderness qualities because of the appearance of an oil platform in the area. The hazards of shipping oil would result in some risk to recreational beaches and fishing areas at the outlets of rivers and streams. Cleanup of oil spills would result in some disturbance to recreational beaches. All of these effects would be very low because of the procedures usually followed during leasing and development. Such procedures are regulated by laws that were listed in previous EIS's (see Sale 83, 88, and 89 FEIS's, Section IV).

It is unlikely that there will be even partial closure of some public water-oriented recreational facilities for a short period at any time of the year. There will be some lowering of the quality of resources.

CONCLUSION: Impacts on recreation and tourism would be very low.

CUMULATIVE IMPACT: Impacts on recreation and tourism are caused by similar factors to those given in the Final Supplement to the Final FEIS, Proposed Five Year OCS Oil and Gas Lease Sale Schedule for January 1982-1986 (USDOI, MMS, 1981).

CONCLUSION: The cumulative effects are low.

(e) Impact on archaeological resources

Effects on archaeological resources would result from disturbance to underwater landforms, shipwrecks, and historic sites. Onshore prehistoric and historic sites are likely to be affected by increases in industrial populations which, in visiting the site, accidentally disturb it.

There have been no detailed studies in offshore areas of this planning area. There are numerous archaeological resources onshore of the lease area. The offshore areas have few existing landforms that could have survived the currents and wave action. Shipwrecks of the Hope Basin area could be disturbed by increased interest in the area and several ships in the area could be located as a result of oil and gas exploration activities. Existing laws and regulations protecting both onshore and offshore resources would prevent disturbance in most areas. The MMS procedures could require consultation with both Federal and State Historic

Preservation Offices through consideration measures prior to any exploration or development.

Cape Krusenstern beach ridges in the National Monument are nearby. It is possible that unique archaeological or historical resources exist within the area and may be disturbed, resulting in minimal loss of data; and also non-unique archaeological or historical resources exist which may be contacted or disturbed, resulting in loss of data which may be equally obtainable from other sources.

CONCLUSION: Impacts on archaeological resources would be low.

CUMULATIVE IMPACTS: Impacts on archaeological resources are caused by similar factors to those given in the Final Supplement to the Final FEIS, Proposed Five Year OCS Oil and Gas Lease Sale Schedule for January 1982-1986 (USDOI, MMS, 1981).

CONCLUSION: The cumulative effects would be low.

(f) Impact on transportation systems

Given the lack of offshore transport support infrastructure in the Hope Basin offshore operations, particularly during the exploratory phase, activity would be supported by "wareboats" anchored near the drilling site, these vessels would be supplied when needed by ships from outside the planning area. The "wareboats" operations would be augmented by shallow draft barges from Kotzebue and helicopter traffic required for personnel transfer and emergency purposes. During the development and production phase a support base with an attendant airfield would probably be built in proximity to the pipeline landfall.

In all cases the airfield at Kotzebue should be able to handle throughput traffic related to petroleum operations. Some additional structures, i.e., transient dormitories, administrative quarters and warehouses, may be required. In regard to marine traffic, production will be piped to the TAPS line thus eliminating the need for tankerage out of the area.

CONCLUSION: Overall impacts of the proposal are expected to be moderate.

CUMULATIVE IMPACTS: The proposed program and the development of the Red Dog mine are the only two major projects forecast to occur within the planning area. Both would tend to operate exclusively of each other except for the sharing of the Kotzebue airfield.

CONCLUSION: Overall effects are expected to be moderate.

(g) Impact on military uses

This is not a topic of concern in the Alaska OCS Region, as there are no restricted areas.

(h) Impact on subsistence-use patterns

The pipeline landfall could be in the vicinity of Cape Krusenstern and travel overland to connect with TAPS. Air and marine support bases could both be in Kotzebue.

One major spill of 1,000 barrels or greater would be expected. Low disturbance effects, primarily on bowhead whales and caribou, would be expected. Interference effects on the subsistence activities of the residents of Kotzebue would be very low. The effect of increased competition for subsistence resources in Kotzebue would be very low. See discussion in IV.B.11.a.(5), Impact on Native Subsistence.

CONCLUSION: The overall effect on subsistence would be low.

CUMULATIVE IMPACTS: Increased air and marine traffic in the area could increase the threat of disturbance and interference on the subsistence resources used by the residents of the planning area. Only a marginal increase in risk to subsistence resources could be expected from the proposal.

CONCLUSION: The cumulative effect of industry activities could result in low effects on subsistence in the planning area.

(i) Impact on sociocultural systems

Conditional resource estimates and the probability of discovering recoverable hydrocarbons are both extremely low for this planning area. No OCS exploration has occurred here to date. If exploration occurred, the region could anticipate very low effects on its sociocultural system in the form of concern, anxiety, and organized activity opposed to industrial development. Growth of support for this new form of employment might also occur. It is not likely that other direct effects would occur. For further information on this region and its cultural systems, see Cultural Dynamics, Chukchi Sea Sociocultural Systems, 1983, and TR 77-Vol.III, Baseline Ethnographic Descriptions of the NANA and Aleutian-Pribilof Regions, by Louis Berger & Associates, 1983.

CONCLUSION: Sociocultural effects are expected to be very low.

CUMULATIVE IMPACTS: Development of the Red Dog Mine and tankering of northern oil production could add some minor increase to the low effects projected from potential OCS exploration and development.

CONCLUSION: Cumulative impacts are expected to be low.

b. Unavoidable Adverse Impacts

Section IV.B.11.b. presents a discussion of the unavoidable adverse impacts of the proposal for all Alaskan planning areas.

c. Relationship Between Short-term Uses of the Environment and the Maintenance and Enhancement of Long-term Productivity

Section IV.B.11.c. presents a discussion of the relationship between short-term uses of the environment and the maintenance and enhancement of long-term product-ivity attendant to the proposal for all Alaskan planning areas.

d. Irreversible and Irretrievable Commitment of Resources

Section IV.B.11.d. presents a discussion of the irreversible and irretrievable commitment of resources attendant to the proposal for all Alaskan planning areas.

e. Impacts of a High Case Scenario

This section provides a discussion of the potential environmental impacts that could occur in the unlikely event that all unleased, undiscovered, economically recoverable hydrocarbon resources in the Hope Basin Planning Area are leased and developed as a result of the proposal. The estimated "High Case" hydrocarbon resources for the Hope Basin Planning Area are: 170 million barrels of oil and 1,810 billion cubic feet of gas. These estimates are higher than the "Base Case" for the proposal. However, infrastructure expected to be used to explore and develop these resources includes 13 exploration and delineation wells, 49 development wells and 1 platform. This is not significantly different from the proposal (13 exploration and delineation wells 40 development wells and 1 platform). In addition, the estimated number of oil spills greater than 1,000 barrels remains at one the same as the base case proposal.

It is important to point out that the Hope area does not have existing offshore development. Resource estimates and infrastructure for the high case are the same as for the cumulative case. However, the high case assumes that the resource will be developed as a result of proposed 5-year program lease sales, while the cumulative case assumes that leasing and development will extend over the future 5-year programs lease sale.

Impacts to all resource categories analyzed may increase slightly, however, the significant differences in impacts cannot be differentiated from those described for the base case for Alternative I because of the relatively small amount of change in oil and gas resources and facilities needed to explore for, develop and produce them.

f. Impacts of Alternative II - Subarea Deferrals

This alternative evaluates the possible deferral of 13 subareas. These are in addition to the 14 subareas deferred under Alternative I. None of the additional subarea deferrals included in Alternative II are within this planning area, therefore, the expected environmental impacts of Alternative II in this planning area are identical to the expected impacts of the proposal.

g. Impacts of Alternative III - Add a sale in the Straits of Florida

Adding a sale in the Straits of Florida will not effect this planning area. However, under Alternative III all sales proposed in Alternative I - the proposal, would be held. Therefore, the expected impacts of Alternative III are identical to Alternative I for this planning area.

h. Alternative IV - Biennial Leasing

Because no difference in the number of sales nor development assumptions is anticipated for this planning area between this alternative and the proposal, there will be no change in impact levels for the resources analyzed in the physical, biological and socioeconomic environments.

i. Alternative V - Acceleration Provision

No difference in number or timing of sales is projected for this planning area between this alternative and the proposal. There will be no change in impact levels for the resources analyzed in the physical, biological and socioeconomic environments.

j. Impacts of Alternative VI - Defer Leasing in Six Planning Areas: North Atlantic, Washington and Oregon, Northern California, Central California, Southern California, and North Aleutian Basin

Selection of Alternative VI would defer leasing in the North Aleutian Planning Area (Alaska Region). Selecting this alternative does not change the proposal nor the items considered for cumulative effects for the Hope Planning Area. Therefore impacts to the Hope area would remain the same as for Alternative I (proposed action) if this alternative was selected.

k. Impacts of Alternative VII - No Action

Under this alternative, the Secretary of the Interior would propose not to schedule any oil and gas lease sales for this proposed 5 year program. All potential impacts from OCS oil and gas activities to the physical, biological, and socioeconomic environment resulting from hydrocarbon exploration, development, and production would be eliminated.

Oil and gas are currently the nation's primary energy source. Even with a vigorous conservation program the United States demand for energy will continue to grow. With the adoption of Alternative VII the oil and gas that would have been available as a result of this proposed program would no longer contribute to the national domestic production during the life of the program.

With the removal of the potential oil and gas into the national energy reserves, it would necessitate the increased production of energy from other conventional and non-conventional energy sources (see Appendix C), and/or increases in import levels from foreign sources. Impacts resulting from the development of the alternative energy sources are summarized in Section II.A.7 and discussed further in Appendix C.

20. Chukchi

a. Alternative I

The proposal includes holding 2 sales in the Chukchi Sea Planning Area. It is estimated that the sales will produce about 1152 MMbls of oil and no gas over a 35 year period. These resources will be produced from 105 production wells from 3 platforms. In addition to the oil, about 10 to 500 MMbls of formation water will be produced. Approximately 459 thousand barrels of drilling muds and fluids and 512 thousand barrels of drill cuttings could be discharged into the sea over the life of the proposal. About 37 exploration wells will be drilled. It is anticipated that one support base will be developed. Generic discussion of the effects of oil and gas activities on all resource categories is provided in Section IV.B.11.a.(3),(4) and (5).

(1) Interrelatonships of Proposal with Other Projects and Proposals

Section IV.B.11.a.(1) presents a discussion of the interrelationships of the proposal with other projects and proposals for all Alaskan planning areas.

(2) Projects Considered in Cumulative Impact Assessment

Section IV.B.21.a.(2) presents a discussion of the projects considered in the cumulative impact assessment for this planning area.

(3) Physical Environment

(a) Impact on water quality

Agents which are most likely to affect water quality in the Chukchi Planning Area are dredging, gravel island construction, deliberate discharges from platforms, and oil spills. These agents and their potential impacts are discussed below. (See the Arctic Sand and Gravel FEIS (USDOI, MMS, 1983) for extensive discussion of impacts from dredging and gravel island construction).

In the Chukchi Sea anchoring of three production drilling platforms and entrenchment of a pipeline would increase turbidity only temporarily over a limited area. Platform discharges of drilling fluids during exploration and production would contaminate less than 1 square kilometer. Production, but not exploration, discharges would continue intermittently over several years. Three oil spills of 1,000 barrels or greater are estimated and could significantly, but temporarily, increase water-column-hydrocarbon concentrations over several hundred kilometers.

Dredging introduces particulate matter and, therefore, turbidity into the marine environment by disturbing the bottom sediments, by continually discharging a solid/water slurry from a pipeline located at or beneath the surface, and by intermittently dumping large volumes of dredged material.

Experiences with dredging show a decrease in the concentration of suspended sediments with time (2-3 hours) and distance downstream (1-3 kilometers) from the discharge. In the dredging operations associated with artificial island construction and harbor improvement in the Canadian Beaufort Sea, the turbidity plumes tended to disappear shortly after dredging ceased and generally, they were not spatially extensive; sand was the predominate material dredged.

Construction dumping would occur over one to two summers for each platform (3 assumed). Dumping of dredged or shore-barged fill would result in local high turbidity, similar in areal extent to that about dredging sites. Thus, during peak years, platform construction would result in turbidity above the natural ambient range over about 28 square kilometers. The impact to water quality would be low. No long-term or regional effects are expected.

Environmental impact assessment of drilling fluid disposal upon marine receiving waters has been thoroughly discussed in the appendices to three separate EIS's: the FEIS for OCS sale 65 (USDOI, 1978), the Final Environmental Impact Statement for the Proposed 5-Year Oil and Gas Leasing Schedule (USDOI, 1980), and the Final Supplement on the Final Environmental Impact Statement for OCS sale 42 (USDOI, 1979). Additionally, the FEIS for OCS sale 60 (USDOI, 1981) as well as the DEIS for OCS sale 46 (USDOI, 1980) discuss water quality impacts of previous Alaskan OCS leasing proposals.

OCS exploratory vessels and production platforms will discharge drilling fluids in bulk quantities, along with lower-level releases of petroleum hydrocarbons, and sanitary wastes from waste-water discharge sources. OCS production platforms will also be discharging bulk quantities of petroleum formation waters.

Impacts to water quality from drilling mud discharges are limited to a mixing zone with a radius of 100-meters about each discharge point. During peak exploration, up to 0.27 square kilometers of the planning area would have impaired water quality over some portion of the year. Such impairment would exist during periods of actual discharge, but rapidly dissipate afterwards.

Water quality in only a very few square kilometers will be affected by deliberate discharges of drilling fluids from exploration or production platforms. Deliberate discharges other than drilling fluids and formation waters are expected to have negligible impact on water quality and are also regulated by the NPDES general permit for the discharge site. Degradation of water quality would persist less than a year at exploratory platforms, but would continue intermittently as wells were drilled through the years at production platforms.

In addition to these permitted and planned discharges, accidental oil spills will very likely occur. Based on experiences in other OCS areas, a most likely number of three oil spills of 1,000 barrels or greater would be expected if oil is produced from the proposed lease offering. Dispersion of oil into the water column from a major slick is a function of the oil, temperature, wind and waves, and age of the spill. As an oil slick ages, lighter hydrocarbons are lost and slick viscosity increases. The energy required to break loose an oil droplet is increased and so the dispersion rate diminishes--roughly exponentially--with time. Almost all of the oil that is dispersed into the water column is in the form of droplets; only a very small fraction is truly dissolved.

Because of unavoidable chronic and accidental discharges of oil, measurable degradation of existing pristine water quality is very likely to occur in the planning area. Plumes of dissolved hydrocarbons from a major spill could be detectable over the low background levels for perhaps 100 kilometers, or possibly 500 kilometers, if under ice. Occasional tar balls would also be expected. Likely increases in dissolved hydrocarbon concentrations, however, should appreciably degrade water quality only in limited areas and for short periods. The most likely number of three spills of 1,000 barrels or greater could significantly, but temporarily, degrade water quality over larger areas.

CONCLUSION: Impacts on water quality from the proposal would be low.

CUMULATIVE IMPACTS: Cumulative impacts include those from the proposal plus those arising from existing lease sales. This also includes potential tankering from Prudhoe Bay and potential tankering of Canadian crude through the area. Seven oil spills are estimated and could significantly, but temporarily, degrade water quality in the area. Overall, oil pollution would be increased from that for the proposal alone, but no other effects on water quality would be greater than for the proposal, due to the timing of the two sales, their production/construction schedules, and the duration of anticipated effects. Significant long-term effects on regional water quality would still be very unlikely.

CONCLUSION: Low water-quality effects would occur.

(b) Impact on air quality

In the Chukchi Sea, effects on air quality from the proposal are expected to be low, based on projected emissions of offshore exploration and production activities (up to three platforms) and one potential onshore facility in an area of pristine air quality. Projected peak emissions would not exceed State or Federal air-quality limitations unless concentrated nearshore in small areas. In that event, existing control technology would ensure attainment of standards, although air quality would not be absolutely pristine near facilities. Air-quality effects for the proposal are expected to be analogous to those identified for Lease Sale 60 (Lower Cook Inlet/Shelikof Strait; USDOI, BLM, 1981). Onshore emissions also would be subject to Federal PSD review and modeling. Additional air-quality analyses may be required by permitting agencies prior to any production activities.

Nitrogen and sulfur oxide emitted from projected oil/gas activities would be the only frequent pollutants with obvious potential environmental consequences. Very rarely in situ burning of major oil spills could temporarily degrade air quality. Air quality would remain good and within statutory requirements, but the incremental degradation of quality that would occur could impact coastal tundra (but not marine) ecosystems.

CONCLUSION: Effects on air quality from activities of the proposal would be low.

CUMULATIVE IMPACTS: Cumulative effects of offshore emissions also are expected to be low. The cumulative amount of offshore emissions which could occur nearshore may be estimated by combining the emissions projected for the adjacent areas. The combined production-related emissions could exceed Department of the Interior air-quality-analysis exemption levels for all pollutants if all operations (possibly as many as seven platforms) were located approximately 5 kilometers (3 miles) offshore at common boundaries. This is highly unlikely, because industry interest is usually farther offshore and widely dispersed.

Cumulative air-quality impacts would include the onshore facility. This facility would have to meet all Federal and State air quality standards and Class II PSD standards; and, as such, control technology would be required.

Again, because an oil-storage and pump station at Point Belcher would be required to meet State and Federal ambient-air-quality and Class II PSD limitations, no unavoidable effects on air quality are foreseen.

CONCLUSION: Cumulative effects on air quality would be low.

(4) Biological Environment

(a) Impact on plankton and benthos

Refer to Section IV.B.11.a.(4) in this document for details on effects to plankton and benthos that may occur as a result of oil activities associated with the proposal.

The biota that could be affected by activities included in this proposal include the planktonic, epontic, and benthic communities. Activities or agents that may produce effects on these life forms include an estimated three oil spills, drilling fluid discharges (459,000 bbls), formation water discharges (10 to 500 mbbls), dredging, and construction of artificial islands, causeways and a pipeline.

Extensive reviews of the impacts of offshore petroleum exploration on planktonic and benthic organisms have been provided by Johnson (1977) and Environmental Sciences Limited (ESL, 1982). Further, the observations of effects on planktonic and benthic communities following several major spills have been reviewed and summarized by Duval et al. (1981).

Short-term impacts would include declines in abundance and diversity of planktonic organisms resulting from both acute and chronic, lethal and sublethal toxic responses to oil, discharges, and turbidity plumes created by dredging and construction operation. Long-term effects would result from long-term changes in temperature salinity and/or circulation patterns around islands and causeways, and the long-term discharge of formation waters during production.

Effects from most of these activities would be considered low. Dredging and construction could result in the physical disturbance of benthic habitat and turbidity that decreases growth of flora.

Oil spills could produce moderate regional effects on benthic habitat, even though the likelihood of occurrence is remote. Vast areas of nearshore (intertidal or subtidal) and backshore (delta or marsh) benthic habitats could be contaminated by a large oil spill and produce lethal and sublethal effects on benthic organisms that persist for years (assuming no or inadequate cleanup of oil). In the more sheltered areas, such responses could persist for decades.

CONCLUSION: Low effects would occur.

CUMULATIVE IMPACTS: Proposed and existing oil and gas development would result in cumulative effects on planktonic and benthic organisms of the Chukchi Sea Planning Area. The proposed and existing leasing includes two Federal and some State offshore oil and gas leasing, and possible transport of oil produced in Canada through the planning area. This increase would subsequently increase the potential for effects on marine planktonic, epontic, and benthic organisms.

The effects from seven estimated spills would be qualitatively the same as those discussed for the three spills estimated for the proposal, except for the greater number of sites that would be affected, and the greater likelihood that sensitive backshore, and nearshore intertidal and subtidal benthic habitats could be affected. Effects on planktonic and epontic organisms would be confined to the general area of the spills, with recruitment occurring soon after the oil degrades and disperses. Effects on plankton and epontic communities would not exceed low even from cumulative offshore leasing.

The seven platforms from which drilling fluid and formation water discharges could occur as a result of proposed and existing Federal and State leasing is slightly more. However, effects on planktonic organisms would be confined to a 1,000-meter radius around each platform, and therefore, would be low. Effects on benthic habitats would be confined to a few hundred meters around each of seven platforms and likewise would be low.

The effects on plankton and benthos from these cumulative activities from dredging and construction (islands, pipeline, and causeways) would be similar to those for the proposal (low effects), even though they occur at substantially more sites.

CONCLUSION: The cumulative effects would be low.

(b) Impact on fish resources

Fish of the arctic region differ from their counterparts in subarctic or temperate regions. Anadromous and some freshwater fish move into the nearshore area in the summer to feed and return to the rivers in the fall to overwinter and spawn. A few marine species also use this nearshore area for feeding; with minor exceptions, these species return to the deeper, more offshore regions during and following freeze-up to overwinter and spawn. The nearshore area is an important migration corridor and feeding area. The nearshore zone, therefore, would be the most sensitive to petroleum related effects, particularly in those areas that harbor overwintering fish in and near the major river deltas.

The three oil spills estimated could produce a variety of lethal and sublethal responses in fishes occurring in the planning area. These effects, however, are not expected to exceed low, considering the low toxicity of oil, low concentrations of oil associated with slicks, and the relatively broad distribution of fish.

The most sensitive time for local pink salmon is when smolts leave rivers such as the Utukok, Kokolik, Kukpowruk, and Kukpuk, reside in estuarine habitats for several weeks in June and July prior to moving elsewhere. An oil spill could cause a high percent of mortality to a river's production of pink salmon fry, thereby significantly reducing returns of adult salmon 2 years later. Because it might take several generations for these small stocks to recover, effects would be moderate. Effects on adult pink salmon are considered low in that many would likely return to spawn, even if they were delayed by an oil spill in their pathway (Craig, 1984).

The life history characteristics of arctic char demonstrate a resilience to short-term perturbations and seem geared to accommodate the loss of a segment of their population (e.g., loss of a year-class because of poor reproductive success). The effects of oil spills on arctic char are expected to be low because: (1) the fish are long-lived and are multiple-year spawners; (2) unlike pink salmon, arctic char fry remain in fresh water for a variable number of years before smolting; (3) migration patterns tend to result in different segments of the population being in different areas, thus an oil spill would not wipe out the entire population; and (4) vulnerable life history stages occur in rivers away from coastal area--spawning, egg incubation, and overwintering (Craig, 1984).

The construction of gravel causeways, if used, could provide a potential for adverse effects on regional populations of anadromous fish. Studies of the Prudhoe Bay causeway showed that deflection of the longshore current offshore was instrumental in altering temperature and salinity around the causeway. With the prevailing northeast winds, temperatures on the west side would be 2 to 4 degrees cooler while salinities would increase by 10 parts per thousand (Bendock, 1979). Although these differences are well within the range of fluctuations frequently observed in the area (Craig and Haldorson, 1981), the consistent tendency for these differences might affect fish.

Currently, the nature of cumulative causeway effects should be treated as an unknown. Recent studies by Fechhelm and Gallaway (1983) have shown that at least one important anadromous species, arctic cisco, exhibits a definite temperature preference which relates positively to its distribution along the coastline. By modeling movements and distribution of arctic cisco relative to changes in temperature and salinity around the Prudhoe Bay causeway, Neill et al. (1982) estimated that a slight reduction (about 7%) in fish density would occur in the area of less preferable conditions (lower temperatures and higher salinities). Additionally, these causeway-induced changes could pose migration and movement "barriers" to those species that require less saline conditions (broad and humpback whitefish).

It is important to note that construction of causeways is regulated by a permitting process administered by the U.S. Army Corps of Engineers under the provisions of Section 404 of the Clean Water Act. Under this process, an environmental assessment would be made of several site- or design-specific alternatives, thus allowing the most environmentally preferred alternative to be identified.

Effects on fish resources from drilling discharges would be very local and very low in both the short and long term. This is due to the low toxicities of drilling muds (459,000 bbls), their rapid dilution and dispersion and low densities and mobile behavior of marine fish in this region.

CONCLUSION: Effects on fish resources are not expected to exceed low.

CUMULATIVE IMPACTS: Proposed and existing oil and gas development would result in cumulative or additional effects on the fish resources of the region. These existing or proposed activities include both onshore and offshore, State and Federal oil and gas leasing in the Beaufort Sea region, and possible tankering of oil produced in Canada through the planning area.

Cumulative effects on fish resources in this region would occur from both onshore and offshore, proposed and existing State, Federal (2 sales), and North Slope Borough leasing. Causal agents for onshore effects include construction activities, oil spills, water withdrawal, and water pollution.

The construction of causeways for development of State leases is possible. Presently, plans exist for a causeway system for the subsea oil pipeline where it moves onshore at Point Belcher. The presence of a causeway could disrupt temperature, salinity, and circulation patterns, and affect fish movement.

Discharges of drilling effluents from State leases would not add significantly to effects on fish, because of the stringent discharge requirements usually imposed in waters less than 10 meters deep (which covers a large portion of State waters); further, drilling-fluid discharges are generally prohibited under nearshore ice, and oil-based drilling fluid discharges are prohibited.

The number of exploration wells is expected to increase from 37 for the proposal to 85 and production wells from 105 to 263. Moderate effects would be likely as compared to unlikely for the proposal alone.

CONCLUSION: Cumulative effects on fish resources are expected to be moderate.

(c) Impact on marine mammals and caribou

Six species of nonendangered marine mammals-Pacific walrus; ringed, bearded, and spotted seals; polar bear; and beluga whale--commonly occur in a portion of or throughout the Chukchi Sea Planning Area and are very likely to have some interaction with OCS activities. Oil pollution and disturbance due to increased human activity and alteration of habitats could adversely affect marine mammal populations found in the planning area. The general effects of oil spills, noise and disturbance, and habitat alterations on marine mammals are discussed in Section IV.D.1.a.(4)(c). Impacts on Marine Mammals in the Gulf of Alaska Planning Area.

Nearly the entire nursing female and calf population of the Pacific walrus, an estimated 120,000 bearded seals, and 300,000 to 450,000 ringed seals that occur seasonally or year-round in the eastern Chukchi Sea are the marine mammal populations at greatest risk from potential three oil spills that may be associated with the proposal.

The three estimated oil spills are most likely to affect walruses and bearded, spotted, and ringed seals in the lead system or flaw zone between Point Hope and Point Barrow during the spring and fall migration periods. Large numbers of walruses, perhaps several hundred to several thousand, could come in contact with spills while no more than a few hundred seals are likely to be directly exposed to oil. If portions of an oil spill reached habitats near Wrangell Island, some polar bears could be directly affected. However, no more than a few polar bears are likely to come in contact with oil slicks and die as a result. If the oil spill contact with several thousand walrus occurred and mortality from the spill were inferred, even though the deaths of the walruses involved could have resulted from natural causes due to high population stress and overpredation of food sources, this event could have a low effect on the Pacific walrus population. Oil spill effects on the food sources of ringed and spotted seals and beluga whales are likely to be very low on the regional populations of these marine mammals due to the very local number of prey affected and their rapid recovery. Oil spills may have long-term effects on benthic prey of walrus and bearded seals; however, the amount of benthic habitat and benthic prey affected is likely to be very small in comparison to the amount of benthic resources available in the area. Therefore, effects on walruses and bearded seals from changes in quality and quantity of food due to oil spills is likely to be low, even though there is high predation pressure on the food source. Overall effects of oil spills on marine mammals occurring in the area are likely to low.

Noise and disturbance from air traffic associated with the three platforms for the proposal could have the greatest effects on walrus nursery herds hauled-out on the ice while migrating through the planning area during spring. Disturbance from low-flying aircraft could result in injury or death to walrus calves when the adults stampede into the water. This type of disturbance probably would have a low effect on a portion of the calf population. Aircraft-disturbance effects on other marine mammals are likely to be low

Noise and disturbance from marine-vessel traffic associated with the proposal through the primary lead system could temporarily interfere with the migration of some marine mammals near the ships. However, marine traffic is not likely to block or greatly delay marine mammal migrations. Severe ice conditions are certain to have far greater influence on spring and fall migrations than vessel traffic associated with oil exploration and development. Seismic boats and other marine traffic possibly associated with the three platforms may occur near Kasegaluk Lagoon and Peard Bay and could displace or interfere with beluga whale and spotted seal use of these important habitats. Overall noise and disturbance effects on marine mammals are not likely to exceed low. With effective enforcement of regulations under the Marine Mammal Protection Act, these effects could be low. Effects of dredging, offshore and onshore construction are likely to have low effects on marine mammals. The combined effect of three estimated oil spills and other discharges, noise and disturbance, dredging, and onshore and offshore construction effects on marine mammals are likely to be low.

Caribou: Adverse effects on caribou caused by the proposal are described in Section IV.B.21.a.(4) following this section. Onshore facilities, pipeline landfalls, air and marine support bases, oil and gas treatment and shipping facilities, roads and pipelines all have the capability of stressing the Western Arctic caribou herd. One shoreside facility, a pipeline and adjacent construction/haul road is assumed for this proposal. Based on the analysis in the Beaufort Planning Section, impact from these facilities could reach a moderate level. However, the pipeline and road (the major impacting factors) would probably be routed around the calving grounds thus reducing impacts to a low level.

CONCLUSION: Effects of the proposal on nonendangered marine mammals would be low.

CUMULATIVE IMPACTS: The additive effects of other ongoing and planned projects, as well as the proposal, on nonendangered marine mammals are discussed in this section. Although the probability of any or all planned and ongoing projects reaching developmental stages is generally unknown, this analysis assume that all the following projects do reach developmental stages. These projects could affect marine mammals by oil spills, noise and disturbance, and by habitat alteration.

Cumulative oil-spill risks from the estimated seven oil spills to offshore marine mammal habitats comes from the proposal and existing oil and gas activities in the Beaufort Sea lease area, and Canadian tankering. Proposed and existing leasing in the Beaufort Sea and possible Canadian tankering substantially increase cumulative oil-spill risks to marine mammals occurring in the ice lead or flaw zone between Icy Cape and Point

Barrow during both the winter and summer seasons. Spill risks to marine mammal habitats along the pack-ice front northwest of Point Barrow would also substantially increase over the spill risks from the proposal during both seasons. OCS activities in the Beaufort Sea and Canadian tankering would increase oil-spill risks to offshore marine mammal habitats west of the Chukchi Sea Planning area during the winter season. The above cumulative increases in oil-spill risks to marine mammal populations in the Chukchi Sea could increase oil-spill effects on marine mammals, especially walrus and ringed and bearded seals.

The chance of oil spills affecting one or more species of marine mammals could increase if extensive oil development takes place in both Beaufort Sea and Chukchi Sea Planning Areas and in the Canadian OCS. Ongoing and proposed State lease sales along most of the coast of the Beaufort Sea and Hope Basin would further increase the risk of oil-spill effects on marine mammals. However, the chance that high effects on a regional or local population of marine mammals would occur is still unlikely because arctic marine mammals (ice seals and walrus) are considered low in sensitivity to oil spills or not vulnerable to spill contact (polar bears and belugas) because of their distribution or behavior (see Section IV.D.1.a.(4)(c). Cumulative activities associated with drilling-platform and pipeline construction, such as dredging and gravel dumping, would increase noise and disturbance of marine mammals and increase local disruption and alteration of habitats along the arctic coast to a low level.

One onshore industrial base associated with the possible seven oil and gas platforms could affect marine mammals by increases in noise, human presence, and coastal habitat alterations. Oil and gas exploration and development on the NPR-A and geophysical exploration on ANWR would probably have little direct cumulative effect on most marine mammals unless tankering of this U.S. oil occured in the Beaufort Sea. However, polar bears may be an exception. Oil and gas activities near polar bear maternity dens on land may displace female bears, leading to perhaps reduced reproductive success on the North Slope. However, such disturbance may be reduced by mitigating measures. Increased construction activities in the Prudhoe Bay area from the proposed Endicott development, Point Thompson, Milne Point, and Gwydyr Bay projects could increase local disturbance of denning polar bears. The Prudhoe Bay Waterflood Project could slightly alter local food sources of ringed seals. These effects are likely to be low on marine mammal populations.

In summary, cumulative oil and gas activities of the proposed Chukchi Sea Planning Area and the above offshore and onshore projects would subject marine mammals and their habitats throughout the Alaskan Chukchi and Beaufort Sea areas to a variety of aggregate effects. The high probability of an oil spill from the proposal, existing Federal and State Beaufort Sea and Hope Basin leasing activities, and possible Canadian tankering would subject marine mammal populations and their habitats along the lead system between Point Hope and Point Barrow and along the pack ice from north and west of Barrow to substantial oil-spill risks and potential oil-spill effects. Walrus and ringed and bearded seals are the species most likely to be adversely affected by cumulative oil pollution. Offshore construction of seven platforms and a pipeline would locally disturb marine mammals and alter habitats adjacent to these construction sites along the Beaufort and Chukchi Sea coasts. Onshore oil and gas exploration and development on the NPR-A and geophysical exploration on the ANWR may contribute to disturbance of denning polar bears.

Caribou: Cumulative impacts to caribou would primarily come from onshore development of NPR-A and NSB leases. Additional leasing and increased production of oil resources offshore would probably not require additional onshore pipelines and roads. Therefore these activities would not add to the impacts assessed to the proposal alone.

Onshore development could mean additional roads, pipelines, production platforms and perhaps base camps. All of these plus the necessary noise and disturbance that attends the facilities will add somewhat to the impacts on caribou. However, because of existing concern and controls on land use and development activities, impacts should not exceed moderate.

CONCLUSION: Cumulative impacts would be moderate.

(d) Impact on coastal and marine birds

The impact of an oil spill on birds in the Chukchi Sea area would vary with the season; volume, nature, and duration of the spill; species and numbers of birds occurring in the areas affected; and many other variables. Spills that occur during the winter would have no immediate effects on most birds with the exception of overwintering black guillemots in ice leads and polynyas. However, oil that remains in the ice after winter cleanup efforts may directly affect birds during the following spring breakup period or indirectly affect them through changes or reductions in food source availability.

Oil spills that occur or melt out during spring breakup, or during the open water period, are likely to have immediate effects on some birds. Species most likely to suffer direct mortality would be alcids, particularly murres, sea ducks (specifically oldsquaw and eiders), and loons. Depending on the timing and areas contacted by the spill, other birds such as phalaropes, brants, and other waterfowl may also be directly contaminated by oil that contacts leads in the ice during spring, or coastal marshes or lagoons during the summer-fall feeding periods. In the above cases, several hundred to several thousand birds may be directly killed. Birds that are more likely to avoid direct mortality from an oil spill, such as gulls and terns, or other birds that may survive partial oiling, could incur various pathological effects from oil ingestion and reduced productivity from egg or chick mortality or displacement from local habitats.

The effects of an oil spill on most species of marine and coastal birds are likely to be low because of the rapid recruitment of birds from adjacent areas. However, species that are highly vulnerable to oil spills, such as murres and other alcids, could suffer moderate effects on regional populations because of their low reproductive rates. Adverse effects incurred due to loss of available food sources are likely to be local near the spill site and last for one season or less. However, oil contamination of sensitive habitats such as salt marshes may have long-term effects lasting several years. If major portions of Kasegaluk Lagoon salt marshes were severely contaminated, such an event could affect several thousand birds and would be considered a moderate effect.

Low-flying aircraft related to the three platforms could cause disturbance of bird feeding, molting, and nesting concentrations along the coast. Disturbance of large flocks of molting and feeding waterfowl and shore birds in the Kasegaluk Lagoon and Peard Bay habitats may result in higher migration mortality and lower winter survival of affected birds. However, only infrequent aircraft disturbance is expected and therefore is likely to have low effects. Vessel traffic disturbance of birds is likely to be brief, with short-term diving and flight reactions by the birds. This disturbance is likely to have no measurable effect on the well-being of birds involved. However, vessel traffic that moves through lagoons and other coastal-concentration areas could have moderate effects.

Offshore and onshore construction and development are likely to temporarily disturb and displace some birds from local habitat areas that would be altered by these activities. Dredging, pipelaying, and platform construction would have local short-term, or low, effects on birds.

CONCLUSION: The effects on coastal and marine birds are likely to be moderate.

CUMULATIVE IMPACTS: Ongoing and proposed oil and gas activities in the Chukchi Sea and adjacent onshore areas would subject coastal and marine birds and their habitats to a variety of aggregate effects. Potential cumulative oil spills (a possible seven) from Federal and some State leasing activities and possible Canadian tankering would subject bird populations and habitats in the Peard Bay and Kasegaluk Lagoon areas to considerably higher oil-spill risks, and potentially moderate oil-spill effects. Eiders, oldsquaw, murres, and phalaropes are the species groups most likely to be adversely affected by cumulative oil pollution. Combined onshore oil and gas activities proposed and ongoing in the Prudhoe Bay-Kuparuk fields, Naval Petroleum Reserve in Alaska, Alaska National Wildlife Refuge, and the Canadian Mackenzie River Delta could have long-term disturbance and habitat effects on birds if several tundra nesting and feeding areas were destroyed or made unsuitable for successful reproduction. High effects on bird populations are possible from the combination of potential oil spills, disturbance, and habitat alterations.

CONCLUSION: High effects on marine and coastal bird populations could occur.

(e) Impact on Endangered and Threatened Species

Four species of whales utilize habitats in the Chukchi Sea Planning Area - gray, fin, bowhead, and humpback whales. The threatened arctic peregrine falcon may nest in the upland area around Point Hope. There are no listed plant species in areas adjacent to the planning area. Refer to Section IV.B.11.a.(4)(e). in this document for details on effects to endangered or threatened species that may occur as a result of oil and gas activities associated with the proposal.

There is a 20 percent marginal probability of 1152 MMbbls of oil speculated to be in the planning area. If this amount of oil is discovered, up to 105 development/production wells will be drilled from three platforms between the two sales to be offered in this area. Up to three oil spills are expected to occur. Oil will be piped to a new land base at Point Belcher and from there piped to the existing TAPS line. A pipeline to Point Belcher will cross the migration paths of the whales.

Gray whales will be susceptible to noise associated with the pipelaying activities as they feed in the area of Point Belcher. Excessive annoying noise has resulted in gray whales abandoning lagoons elsewhere along the migration paths. Fin and humpback whales also are in the planning area feeding during the open-water period. Approaches near whales of supply vessels or active geophysical seismic vessels could result in whale displacement to less desirable habitats. Bowhead, if low on blubber reserve from the winter, could abort fetuses or display active avoidance behaviors to annoying noise levels. Migration routes or fall feeding areas may be altered in response to loud noise levels. Peregrine falcons could abandon nesting areas if the pipeline from Point Belcher to the TAPS were constructed near the nesting cliffs along the Colville River.

CONCLUSION: Effects on endangered or threatened species are expected to be low.

CUMULATIVE IMPACTS: Exposure to oil spills or loud noise disturbances along whale migration routes or in various feeding areas will affect the species on a long-term basis. Detrimental effects to a species already at low population levels may further hasten their extinction. Habituation to some noise may occur once the species determines that the noises are not threatening. Sublethal and lethal effects may occur to species that traverse many planning areas where oil and gas activities interact with them.

CONCLUSION: Long-term effects on endangered whales are expected to be moderate and low on the peregrine falcon.

(f) Impact on estuaries and wetlands

These topics are discussed and impacts analyzed where they occur as habitat for the fish and wildlife species in (4)(a) through (4)(f) in this section.

(g) Impact on areas of special concern

These areas are all habitat for the fish and wildlife species in (4)(a) through (4)(f) and impacts are discussed as they occur in the planning areas.

(h) Impacts on marine sanctuaries

There are no marine sanctuaries in the Alaska OCS Region.

(5) Socioeconomic Environment

(a) Impact on employment and demographic conditions

The pipeline landfall could be in the vicinity of Point Belcher and travel overland to connect with the TAPS. Air and marine support bases may be located in the Wainwright area.

The probability of the discovery of commercial quantities of petroleum resources in the Chukchi Sea area is considered to be 20 percent, and the mean estimates of discoveries expected to result from the proposed 5-year leasing program are 1152 million barrels of oil.

Most petroleum workers in the area probably would live in isolated dormitories during work periods, and would commute during rest periods to permanent residences in other regions of Alaska or outside the state. Most in-state commuters would reside in the Anchorage Region which is judged capable of handling the increase. The long-term employment effects resulting from the proposed 5-year leasing program, including all indirect employment effects, would total about 500 jobs statewide, and the corresponding population effects would be about 1,500 new residents of Alaska. Peak activity would be about the year 2000.

It is assumed that the lion's share of any population increase will be borne by Anchorage, Fairbanks, and the adjacent regions. The 71 FEIS, (USDOI, 1982) outlines a number of social impacts normally associated with moderate levels of population growth in such urban areas. These include increased demands on utilities, housing, state and local government services, and social and medical resources. Increased pressures will accompany the proposed action. However, the consequent incremental changes in Alaska's population are small enough that any such problems will likely be lost in the effects of the general population growth expected for the state.

Any primary or secondary population impacts would be most intense during peak construction and development periods. However, because the proposal adds only small increments to the population growth expected for the region, its effects would probably be low.

In the Anchorage, southcentral Alaska, and Fairbanks Regions, economic impacts of the proposed lease offering would be low. Job opportunities would be increased and would be beneficial in nature compared to the job totals which are forecasted for those regions in the absence of the proposal. These additional employment opportunities would include jobs in the offshore lease area and at remote sites in the North Slope Region, to which workers would commute from homes in the Anchorage, southcentral Alaska, and Fairbanks Regions. In those regions, effects of the proposal would increase the resident population slightly above the population forecasted in the absence of the proposal. No stress on community infrastructure would occur as a result of the expected population impacts. Economic and population impacts are expected to be very low in the North Slope Region because virtually all jobs would be filled by commuters from outside the region. Other areas of Alaska outside the Anchorage, southcentral Alaska, Fairbanks, and North Slope Regions would be almost totally unaffected.

CONCLUSION: Effects would be low.

CUMULATIVE IMPACTS: If all hydrocarbon bearing areas of the Chukchi Sea Planning Area are leased and all resources subsequently are developed over the life of the proposal, the total cumulative effects on resident employment and population in the adjacent land area (Barrow-North Slope Census Division) during the years 1980-2000 probably would be moderate in the sense that only moderate short-term stresses could be expected on public and private services and facilities. (Although resident employment and population could increase by 30 percent, this is not an unusually large increase over a period of 20 years.) These cumulative effects include all anticipated non-OCS activities as well as all OCS activities, in this planning area or in other planning areas, which are expected to have employment or population effects in the land area adjacent to the Chukchi Sea OCS Planning Area.

Anticipated non-OCS activities include possible large-scale onshore natural-gas-development projects. However, most workers associated with any aspect of offshore or onshore petroleum development in the area would live in isolated dormitories during work periods, would commute during frequent rest periods to permanent residences in other regions of Alaska or outside the state, and therefore would have minimal effects on the resident employment and population of the land area adjacent to the Chukchi Sea Planning Area (Barrow-North Slope Census Division). Non-OCS activities, including onshore natural gas development, are expected to account for about half of the cumulative impacts in the Barrow-North Slope Census Division.

Anticipated OCS activities in the Beaufort Sea Planning Area are also offshore of the Barrow-North Slope Census Division. However, as in the case of planned onshore activities, Beaufort Sea development effects on resident employment and population will be minimized by the fact that most petroleum workers will commute out of the region.

Anticipated OCS activities in this planning area, either at the mean-expected-resource development level or in the unlikely event of total development of all area resources, are not expected to have significant resident employment or population effects in the land area adjacent to the Chukchi Sea Planning Area (Barrow-North Slope Census Division). The lack of large effects is due to the fact that most petroleum workers in the area will live in isolated dormitories during work periods, and will commute during frequent rest periods to permanent residences in other regions of Alaska or outside the state. Most in-State commuters will reside in the Anchorage census division, which is many hundreds of miles from the planning area. Statewide resident employment effects of Chukchi Sea OCS development could total 1,500 new people.

CONCLUSION: The effects of the proposal on the resident employment and population would be low.

(b) Impact on coastal land use

Activity on shore adjacent to the Planning Area could generate changes in land use. The shift would be from open areas used for subsistence purposes to developed lands used as a landfall for an offshore pipeline, a support base, and a road/pipeline corridor that may be between Point Belcher and TAPS Pump Station No. 3. Land use plans in place which modify or control land use in the North Slope Borough (NSB) include the Capital Improvements Program (CIP), the comprehensive Land Use Plan Ordinance, and the Alaska Coastal Management Program.

Along the Chukchi Sea coast, the shore base is hypothesized near Point Belcher where there are no suitable existing support facilities. Moreover, Point Belcher is fairly close to the village of Wainwright. Since a landfall and support facility located so near an existing village could lead to adverse impacts, they probably would need to be designed and constructed in an appropriate way.

During development and production, additional shore base facilities closer to the producing field may be requested. Since these sites cannot be identified in advance, it is not possible to ascertain how many will be requested, how they will be designed, or what their impact may be.

During exploration, ice roads may be constructed either for transporting gravel used in island construction or for connecting a temporary support base with Wainwright. Permanent roads would be built in conjunction with development. Air traffic is anticipated between drilling units and support bases. Most marine traffic would be outside the Borough's jurisdiction and not subject to the NSB policy. Although all types of traffic would be heaviest during development, they would span all three phases. Use of transportation corridors should be feasible either voluntarily or enforced through a special permit.

Most of the above activities would change the land use from what it is now (subsistence-open area) to some degree of industries. However, development onshore adjacent to the Chukchi Planning Area will only use and influence a very small portion of the land available. A haul road and pipeline east from the shoreside facility has the potential to influence land use out of proportion to its size (width or length of land actually used).

CONCLUSION: Land use effects will probably be moderate.

CUMULATIVE IMPACTS: The proposed action and attendent pipeline service roads will act to extend petroleum infrastructure along the Arctic coast to Bullen Point southwest of Barrow. Viewed in conjunction with other petroleum developments, a petroleum infrastructure pattern may emerge which extends from Bullen Point on the Chukchi Sea to the Canning River east of

Prudhoe Bay. The proposed action and allied sales (i.e., the proposed Beaufort Sale) may cause a rapid shift of large portions of land from subsistence use to industrial use.

CONCLUSION: The long term effects of lengthy linear development along the Arctic coast and foothills of the Brooks Range could be high.

(c) Impact on commercial fisheries

There is no commercial fishing in the area.

(d) Impact on recreation and tourism

There have been no previous lease sales in this area, therefore no studies have been done. There could be changes in wilderness qualities because of the possible appearance of oil platforms in the area from land. The hazards of shipping oil would result in some risk to fishing areas at the outlets of rivers and streams. Cleanup of oil spills could result in some disturbance to beaches. All of these effects would be very low because of the procedures usually followed during leasing and development. Such procedures are regulated by laws which have been listed in previous EIS's (See Sale 83, 88, and 89 FEIS's, USDOI, MMS, 1984, 1985).

The Chukchi Sea Planning Area is expected to produce 1152 million bbls of oil. The probability of hydrocarbons is 0.20. Based on these figures, three spills greater than 1,000 barrels are estimated.

Very little recreational or tourist activity occurs along the Chukchi Sea coast. This is because of the distance from population centers, high access cost, bad weather, and lack of facilities. Because of that and the relatively small amount of shore based activity, impacts would be very low.

CONCLUSION: Effects on recreation and tourism would be very low.

CUMULATIVE IMPACTS: Impacts on recreation and tourism are caused by similar factors to those given in the Final Supplement to the Final FEIS, Proposed Five Year OCS Oil and Gas Lease Sale Schedule for January 1982-1986 (USDOI, MMS, 1981). The cumulative effects are no higher than low.

CONCLUSION: Cumulative effects would be low.

(e) Impact on archaeological resources

Effects on archaeological resources would result from disturbance to underwater landforms, shipwrecks, and historic sites. Onshore prehistoric and historic sites are likely to be affected by increases in industrial populations which in visiting the site accidently disturb it.

There have been no detailed studies for this planning area. There are numerous cultural resources onshore of the lease area. The offshore area has few, if any, existing landforms that could have survived the currents and wave action. Shipwrecks of the Chukchi Sea area and near shore that may be disturbed by increased interest in the area. It is also possible that several ships in the area might be located as a result of exploration activities. Existing laws and regulation protecting both onshore and offshore resources would prevent disturbance in most cases. The MMS procedures require consultation with both Federal and State Historic Preservation Offices to consider mitigating measures prior to any exploration or development. This, in addition to the assumed low probability of offshore sites would result in very low impacts.

It is possible that unique cultural or historical resources exist within the area and may be disturbed, resulting in minimal loss of data; and also nonunique cultural or historical resources exist which may be contacted or disturbed, resulting in loss of data which may be equally obtainable from other sources.

CONCLUSION: Effects on archaeological resources would be very low.

CUMULATIVE IMPACTS: Cumulative effects on archaeological resources are caused by similar factors to those given in the Final Supplement to the Final FEIS, Proposed Five Year OCS Oil and Gas Lease Sale Schedule for January 1982-1986 (USDOI, MMS, 1981).

CONCLUSION: Cumulative impacts would be very low.

(f) Impact on transportation systems

The principal effect of the proposed action may be the further extension of transportation systems infrastructure into western arctic regions. Heretofore, traffic within this region has been limited to air transport. Depending on the outcome of exploration and development efforts, oil produced as a part of this proposal could flow into pipeline systems constructed in response to previous petroleum finds. This order of events would tend to reduce the effects of the proposal, which otherwise could result in extensive infrastructure construction. However, an extensive find in the Chuckchi Sea may require the construction of a separate pipeline system probably sited along the right-of-way of an existing system. Discoveries in the Chuckchi would cause a large scale increase in logistics traffic frequenting the western arctic and tend to sustain barge support base/base camp complexes well into the next century.

CONCLUSION: Hydrocarbon discoveries in the Chuckchi may have a high effect on transportation systems.

CUMULATIVE IMPACTS: The cumulative effects of the proposed action could be significant in comparison with other planning areas. Discoveries within the Chuckchi Sea Planning Area could be substantial enough to cause the construction of an additional pipeline system as well as that of additional support bases and related facilities.

CONCLUSION: The cumulative effects of the proposal could be high.

(g) Impact on military uses

This is not a subject discussed in the Alaska OCS Region as there are no restricted areas.

(h) Impact on subsistence-use patterns

The pipeline landfall may be in the vicinity of Point Belcher and travel overland to connect with TAPS. Air and marine support bases may both be located in the Wainwright area. Impact on subsistence includes impact on harvest levels, locations, time and cost involved, the character of subsistence, quantity and quality of Native foods, the subsistence economy, and perceived impacts.

Three spills of 1,000 barrels or greater are projected. Moderate effects of disturbance, primarily on bowhead whales, could be expected because of the proposal. Short-term effects on bowhead whales and caribou are likely, although long-term effects are unlikely. If a pipeline is constructed to Point Belcher, caribou migrations might be altered. In the case of a western find and a pipeline is constructed from TAPS to the Point Lay area, important caribou calving areas may be affected. In these cases, effects could be moderate. If offshore loading occurs, few effects on caribou would occur.

Interference effects on subsistence activities of the residents of Wainwright could be moderate because the pipeline landfall is in an important whaling and marine mammal hunting area. The effect in the area is expected to be low due to controls on enclave residents and the small expected increase in permanent residents.

Inupiat perceptions of the threats of offshore oil development focus on subsistence issues. Inupiat base their perceptions of subsistence impacts on past observations and experience with onshore development and industrial accidents, combined with secondary information, usually from the media. They view this within the framework of a long history of use and knowledge of the arctic environment, the ocean and ice, and the subsistence species upon which their culture is based. For them, biological impacts on wildlife species and habitats are also subsistence impacts.

Because of the bowhead whale's primary role in North Slope subsistence levels and dependency and because of its importance in the subsistence economy and culture, even minor biological effects on this species could have a significant impact on subsistence. For example, if noise causes bowhead whales to be displaced even by a few miles, the successful hunting of them may become impossible. Such a situation is not far-fetched since noise and disturbance from boats, aircraft, geophysical seismic activities, drilling, and dredging and gravel island construction activities are among the most likely sources to affect bowheads.

It is anticipated that localized oil spill effects are likely, it is unlikely that oil spill contact would have significant long-term regional impact on the bowhead population unless a spill occurred in the spring lead system near Barrow at a time when whales are concentrated there. Inupiat feel that such a spill could be catastrophic.

A pipeline landing and/or a support facility at Point Belcher near Wainwright would probably have a major impact on Wainwright subsistence because three important Traditional Land Use Inventory Sites currently used for whaling are in the immediate vicinity: Pinusugruk, Atanik, and Nunagiaq.

Adverse effects on caribou as a result of the proposal would vary according to the location and siting of facilities, roads, and pipelines during development and production, the intensity of associated noise and disturbance, and the natural adaptability of caribou to the changes in habitat conditions. In general, it is felt that local effects on caribou could be substantial; however, the level of effects is uncertain. If a pipeline is constructed onshore through calving areas or across migration routes of the various herds, and effects on caribou result, then effects on subsistence use by local villages could occur.

A pipeline coming onshore at Point Belcher, traversing the NPRA, and crossing the Western Arctic herd migration routes could affect the distribution and integrity of the herd if it serves as a partial barrier to cow-calf movements, especially if the maintenance road is opened for public use. The caribou analysis (See IV.B.21.a.(4)) has concluded that biological effects are not likely to exceed moderate; however, effects on caribou hunting and harvest levels are uncertain due to the lack of knowledge of traditional caribou hunting areas in this region. It is felt however, that subsistence effects would be minimized in the sense that this pipeline would not cross major calving areas. Therefore, caribou harvest levels would probably not exhibit significant changes for the residents of Barrow, Nuiqsut, and Wainwright, unless maintenance road traffic provides significant disturbance to alter migrations and hence distribution of caribou.

Freshwater and ocean fish are also staples of the subsistence way of life. While fish have not become the Inupiat cultural symbols that bowhead whales and caribou have, they are an important part of group camping activities and their relative reliability and availability throughout the year make them very important to the subsistence system. A decline in harvestable stocks sufficient to maintain an adequate supply of fish for subsistence use is not expected; however, a substantial decline may occur over several years if a large oil spill contacted a major delta or if causeways resulted in population declines or changes in distribution. Other effects may include the loss of quality of subsistence fish stocks through oil-induced "tainting" of harvestable populations. This latter effect may result in people not eating fish because of their unpalatability, or perceived unpalatability, and hence be a direct loss to the food supply.

Waterfowl are considered a primary subsistence species, not in terms of quantity of meat provided or amount of time spent hunting, but because of their importance at a certain time of year (spring and summer) and the sociocultural significance of the camping-hunting trips.

Construction may disrupt waterfowl food sources, but this is likely to be local and temporary. In the development phase, a pipeline from Point Belcher across NPRA to Umiat and associated maintenance roads would destroy and alter some waterfowl habitat. Since the specific effects of this pipeline on birds and their habitat are unknown at this time, effects on subsistence are also difficult to predict.

Bearded seal are also considered primary subsistence species. Walrus, beluga whale, polar bear, and ringed and harbor seals are considered secondary subsistence species. Local Inupiat concern about the abundance and protection of these species generally exceeds the current dependency, due partially to the historical role these species have played in the local economy and their value as potential as well as actual food sources. Inupiat are expecially concerned about potential effects of oil spills, seismic and drilling noise, and gravel island construction. They fear gravel island construction will affect seals by altering currents and creating open-water leads in the ice.

In summary, effects on subsistence resulting from potential biological effects are not expected to exceed moderate; however, because of the primary roles of caribou and bowhead whales in the North Slope economy, moderate impacts on either or both of these species could result in major impacts on subsistence.

CONCLUSION: Moderate effects could occur on subsistence use.

CUMULATIVE IMPACTS: Increased air and marine traffic in the area could increase the threat of disturbance and interference on the subsistence resources used by the residents of the planning area. Only a marginal increase in risk to subsistence resources would be expected from the proposal.

Future Federal and State leasing in the Beaufort and Chukchi Seas could directly affect all North Slope village subsistence areas except those of Anaktuvuk Pass. These lease offerings could add significantly to the risk of oil spills, habitat loss, noise disturbance, and the reduction of wildlife throughout the affected areas. The safety of bowhead whales and the availability of these and beluga whales may become a growing concern. If major extensions of onshore facilities such as roads and pipelines occur, these proposals could have important area-wide effects on the distribution of land mammals and on access to important subsistence areas. This would be particularly significant with regard to caribou. Impacts on the state may also be significant.

Starting with the first mandated lease sale in NPRA in December 1981, oil and gas exploration and development in NPRA is expected to continue at least through 2000. The villages of Barrow, Nuiqsut, Atqasuk, and Wainwright are most likely to be affected by NPRA leasing, construction activities, and exploration and development of oil and gas. Terrestrial habitat in the actual lease area would be reduced and sacred sites, a part of the seasonal round of subsistence activities, may be damaged. There may be indirect affects on terrestrial fish and game, hence, increased competition for the subsistence resources which remain. Impacts on the distribution of caribou could be the most damaging. Trapping incomes could also be affected, with a resulting indirect effect on family income available for subsistence pursuits.

CONCLUSION: The cumulative effect of activities could result in moderate effects on subsistence use in the planning area.

(i) Impact on sociocultural systems

Sociocultural effects could be expected, particularly in the Wainwright area, should a new service base be located there. Both the high level of activity and the oil spill potential would directly affect the sociocultural systems of the North Slope Inupiat in the vicinity of these activities. These could include Wainwright, Point Hope, Point Lay and Barrow.

If an oil spill occurred during ice-breakup conditions or during the whale migration, sociocultural effects would be more pronounced and longer in duration. Effects on subsistence could also be substantial; see IV.B.11.a.(5) for greater detail and (the Diaper Field FEIS), (USDOI, 1984).

Interacting with the ongoing urbanization of the North Slope is the Inupiat sociocultural system. This system includes the subsistence economy of each village. It also includes the organization of task groups which carry out subsistence-related activities as well as the traditional forms of the consumption, sharing, and bartering of subsistence goods. The sociocultural system includes, as well, the ways in which kinship, leadership, and the learning of role expectations and traditional wisdom are organized. Finally, it includes the complex of Inupiat cultural values which animate and make meaningful such institutions as the subsistence system, sharing networks, and the kinship system. These values include strong ties to Native foods, to the North Slope environment and its wildlife, to the family, and to the virtues of sharing the proceeds of the hunt. The Inupiat sociocultural system has been affected by past North Slope oil developments and it can be expected to feel the impacts of future ones. It has also played a stabilizing role in a dynamic, changing situation.

The Inupiat believe that social change is largely imposed, that its outcomes are not entirely beneficial, and that it has the potential to damage the core of Inupiat social life through its threats to subsistence activities. However, the North Slope sociocultural system is flexible and over time tends toward readjustment. The incremental effects of new proposals such as this must be emphasized in a sociocultural impact assessment (Sale specific EIS). Without new growth, the level of negative sociocultural impacts, as measured by activities such as alcohol abuse, should tend to drop with time as this readjustment takes place.

This proposal may have a moderate region-wide impact on Inupiat political institutions and cultural integrity. Significant stresses caused by the proposal on the Inupiat people's spirit, on their faith in traditional leadership, and on the organizations involved in their subsistence pursuits may have a moderate impact on sociocultural systems.

CONCLUSION: Sociocultural effects could be moderate.

CUMULATIVE IMPACTS: Cumulative impacts of the Prudhoe Bay and Kuparuk oil discovery and development have affected North Slope villages through the transformation of village and family facilities with the Capital Improvements Program (CIP). In contrast to Beaufort Sea villages, however, Chukchi villages have not experienced the localized effects of oil exploration and development in their immediate vicinity. Localized effect could be initially traumatic, particularly to family and community perceptions, attitudes and values.

Subsistence activities are the primary means by which family traditions, village cohesion, and socio-religious values are maintained and transmitted and protection of these activities is a primary aim of present-day North Slope political institutions. Cumulative effects on subsistence as a result of all projects on the North Slope may be moderate. Therefore, a moderate area-wide impact may be expected on sociocultural systems.

CONCLUSION: Cumulative impacts could be moderate.

b. Unavoidable Adverse Impacts

Section IV.B.11.b. presents a discussion of the unavoidable adverse impacts of the proposal for all Alaskan planning areas.

c. Relationship Between Short-term Uses of the Environment and the Maintenance and Enhancement of Long-term Productivity

Section IV.B.11.c. presents a discussion of the relationship between short-term uses of the environment and the maintenance and enhancement of long-term product-ivity attendant to the proposal for all Alaskan planning areas.

d. Irreversible and Irretrievable Commitment of Resources

Section IV.B.11.d. presents a discussion of the irreversible and irretrievable commitment of resources attendant to the proposal for all Alaskan planning areas.

e. Impacts of a High Case Scenario

This section provides a discussion of the potential environmental impacts that could occur in the unlikely event that all unleased, undiscovered, economically recoverable hydrocarbon resources in the Chukchi Sea Planning Area are leased and developed as a result of the proposal. The estimated High Case hydrocarbon resource for the Chukchi Sea Planning Area is 2,680 million barrels of oil. This estimate is considerably higher than the Base Case for the proposal. Infrastructure expected to be used to explore and develop these resources includes 85 exploration and delineation wells, 263 development wells and 7 platforms. This is significantly different from the proposal (37 exploration and delineation wells 105 development wells and 3 platforms). In addition, the estimated number of oil spills 1,000 barrels and greater is seven.

It is important to point out that the Chukchi area does not have existing offshore development. Resource estimates and infrastructure for the high case are the same as for the cumulative case. However, the high case assumes that the resource will be developed as a result of the current 5-year program lease schedule, while the cumulative case assumes that leasing and development will extend over future 5-year programs' lease schedules.

Water and air quality impacts caused by an increased number of offshore platforms and oil spills would likely be significantly greater than anticipated for the proposal. More frequent in situ burning of oil spills would be expected. It is still very unlikely that state or federal water and air quality standards would be exceeded. Deposition of nitrogen and sulfur derived from existing leases and the proposed action would be greater than that derived from the proposal alone. Sufficient increase in nitrogen and sulfur deposition would likely occur to locally increase the nitrogen balance and acidity of coastal tundra, resulting in unforseen changes in tundra vegetation.

Because State or Federal air and water quality standards would not be exceeded, it is estimated that water and air quality impacts would not exceed low.

The increased amount of estimated recoverable oil for the maximum case would result in higher oil spill risk probabilities, a greater number of platforms or sources of drilling discharges, and an increased amount of dredging and construction activity. Even though the number of site-specific effects on plankton and benthos would be greater than those projected for the proposal, the regional effects of the maximum case would be low, which is the same as the proposal.

The increase in estimated recoverable oil for the maximum case would result in higher oil spill risk probabilities, a greater number of platforms or sources of drilling discharge, and an increased amount of dredging and construction activity. This would subsequently increase the number of site-specific effects on fish resources over those of the proposal; however, the effects are expected to be low. The probabilities of oil spills causing moderate effects to fish populations would be unlikely for the maximum case due to the low probability of oil spills contacting critical fish habitats and the simultaneous occurrence of storm surge events.

Overall impacts on marine mammals due to direct and indirect effects of oil spills or disturbance associated with development and transport of extracted oil would be greater than those described for the proposal. Since the high case assumes about twice the level of petroleum resources as estimated for the base case, an increase in spill contact probabilities for major whale and marine mammal migration/feeding areas would be expected. Increased noise and disturbance associated with higher levels of development which would be expected with the high case could result in more localized changes in distribution and reduced densities of potentially sensitive species (e.g. ringed seals). However, considering the widespread distribution of marine mammals in the planning area and natural recruitment from unaffected areas, impacts on marine mammals would probably not exceed moderate.

Overall impacts on caribou due to disturbance and habitat alterations would probably increase over that described for the proposal. Levels of onshore development are likely to increase in the maximum case. Greater displacement of caribou from summer habitats could occur. Effects on caribou could be moderate.

Doubling the oil resources assumed in the maximum case could significantly increase the chances of oil spills occurring and adversely affecting and disturbing marine and coastal bird populations and their habitats over that described in the proposal. A greater number of birds may be directly killed by oil pollution. In the maximum case, a substantial reduction in local bird populations could occur with perhaps loss of several thousand birds from more than one spill. Impacts could range from moderate to high in the high case. However, natural recruitment of birds from unaffected areas and the wide distribution of alternate habitats indicate that impacts would probably not exceed moderate. Regional populations could also be reduced.

Overall impacts on endangered species due to direct and indirect effects of oil spills or disturbance associated with development and transport of extracted oil would be greater than those described for the proposal. Since the high case assumes about twice the level of hydrocarbon resources as estimated for the proposal, an increase in spill contact probabilities for major bowhead whale migration/feeding areas could be expected for the high case. Increased noise and disturbance associated with higher levels of development which would be expected with the high case could result in more localized changes in distribution and/or density of potentially sensitive bowhead whales, gray whales, and peregrine falcons. Impacts on bowhead whales would probably be moderate. However, high impacts are possible if one or more major oil spills contact a major portion of the bowhead population and if the whales are much more sensitive to oil pollution than present effects studies indicate. Impacts on gray whales and peregrine falcon (both species are uncommon in most of the planning area) would probably not exceed moderate.

Overall impacts to employment and demographic conditions would be low for the North Slope area despite the increase in infrastructure because of enclave development as in the Prudhoe Bay area. Southcentral Alaska and the Fairbanks area could experience moderate impacts because of the increased numbers of workers and their families.

Impacts on subsistence associated with a high find would be more intense than those expected under the proposal. A greater population increase in Anchorage, Fairbanks, and the Southcentral region would increase hunting pressures in those areas, hence, greater conflicts over fish and game management. On the North Slope, higher production levels would raise the risk of oil spills to marine mammals, fish and birds, all key subsistence resources. If such increased risks were realized, local concerns over them would intensify. Probably the effects of onshore facilities would not change, because the number of facilities would remain the same. Impact levels would probably remain moderate, however capabilities of high impacts are present.

With double the projected resource levels, the sociocultural impacts could be higher than those expected from the proposal. Increased threats to subsistence resources could escalate political and social tensions on the North Slope. Increased impacts on these resources could effect the organization and success of subsistence task groups which play an important integrative role in the villages. Such impacts would also undercut support for the involvement of Native corporations in oil development. Sociocultural impacts are expected to remain moderate, although the seeds of high impacts are present.

Because of the minor role commercial fisheries, recreation and tourism, and archaeological resources play in the Chukchi Planning Area, the increases assumed for the high case would not change impact levels on these resource categories from those of the proposal.

f. Impacts of alternative II - subarea deferrals

This alternative evaluates the possible deferral of 13 subareas. These are in addition to the 14 subarea deferrals under Alternative I. None of the additional subarea deferrals included in Alternative II are within this planning area. Therefore, the expected environmental impacts of Alternative II in this planning area are identical to the expected impacts of the proposal.

g. Impacts of alternative III - add a sale in the Straits of Florida

Adding a sale in the Straits of Florida will not affect this planning area. However, under Alternative III all sales proposed in Alternative I - the proposal, would be held. Therefore, the expected impacts of Alternative III are identical to Alternative I for this planning area.

h. Alternative IV Biennial Leasing

This alternative increased oil reserves from 1152 MMbbls in the proposal to 1501 MMbbls. The number of platforms increases from three to four. The number of exploration wells increases from 37 to 48 and the number of development and production wells from 105 to 147. The number of sales increases from 2 to 3. The number of estimated spills over 1,000 barrels increases from 3 to 4.

(1) Physical Environment

(a) Impact on water quality

Resource estimates for the Chukchi Sea Planning Area have increased with this alternative. It is still very unlikely that State or Federal water quality standards would be exceeded. There is only an increase of one producing platform assumed. There should be no increase in the number of shoreside facilities. There is an increase of 1 in the number of estimated spills over 1,000 barrels which could significantly but temporarily increase water-column hydrocarbon concentrations over several hundred kilometers.

CONCLUSION: Impacts would be the same as for the proposal, low.

(b) Impact on air quality

Resource estimates for the Chukchi Sea Planning Area have increased by changing the number of sales in the planning area. The change, however, only adds one platform to the three estimated for the proposal, and increases the number of oil spills by 1.

Although more frequent (4 spills over 1,000 barrels estimated rather than the proposal's 3) and in situ burning of them increased, it is still very unlikely that air quality standards would be exceeded. Shoreside facilities are not expected to increase in number, therefore emmissions should not substantially increase.

CONCLUSION: Effects would be the same as for the proposal, low.

(2) Biological Environment

(a) Impact on plankton and benthos

The increased amount of estimated recoverable oil (349 MMbbls) for Alternative IV could result in higher oil risks (1 more spill in 35 years) or greater number of platforms (1) as a source of drilling discharges. There could be an increased amount of dredging and construction activity associated with the one additonal platform. Even though the number of site specific effects on plankton and benthos resources could be greater than those projected for the proposal, the regional effects of this alternative would be low, the same as the proposal.

CONCLUSION: The effects on the planktonic, benthic, and epontic (under-ice) communities would be low.

(b) Impact of fish resources

The increase in estimated recoverable oil for Alternative IV (20%) would result in higher oil spill risk probabilities, a greater number of platforms or sources of drilling discharge, and an increased amount of dredging and construction activity. This would subsequently increase the number of site-specific effects on fish resources over those of the proposal; however, the effects are expected to be low. Even though the number of spills over 1,000 barrels is increased by 1, effects would remain low because of the low possibility of oil spills contacting critical fish habitats and the simultaneous occurrence of storm surge events driving the oil upstream.

The effect of one additional lease sale in the Chukchi Sea over the next 5 years would be the same as the effects of the proposal. Effects on regional populations from the presence of several causeways along the coastline are unknown.

CONCLUSION: Effects on fish resources are not expected to exceed low.

(c) Impact on marine mammals

Potential oil spill and noise and disturbance effects on marine mammals in the Chukchi Sea planning area could increase somewhat over the proposal by the addition of another lease sale for the planning area on the 5-year schedule. The number of oil spills associated with OCS activities in the planning area is four; the population effect (local or regional) on walruse and ice seals probably would not exceed moderate, while spill effects on polar bears would probably remain low and effects on nonendangered whales would likely be very low. Noise and disturbance effects from air and marine traffic associated with assumed higher levels of exploration and possibly higher development activities (one additional platform) under this alternative may increase somewhat. However, the increase in frequency of air and vessel traffic disturbance of marine mammals, particularly haulout walruses and spotted seals, is not expected to have more than a low impact on the local or regional populations. (See discussion in Sec.IV.B.20.a.(4) impacts of the proposal). Overall impacts to caribou would probably remain the same as the proposal because shoreside infrastructure is not expected to increase.

CONCLUSION: The OCS oil and gas impacts under this alternative for the Chukchi Sea Planning Area are likely to have low impacts on walruses, ice seals, polar bears, and nonendangered cetaceans. Impacts to caribou would be low.

(d) Impact on coastal and marine birds

An increase of 20% in oil resource estimates increased the number of oil spills occurring and adversely affecting or disturbing marine and coastal bird populations and their habitats over that described in the proposal. A greater number of birds may be directly killed by oil pollution. In this alternative, a reduction in local bird populations could occur with perhaps loss of several thousand birds from more than one spill. Natural recruitment of birds from unaffected areas and the wide distribution of alternate habitats indicate that impacts would probably not exceed moderate. Regional populations could also be reduced.

The potential adverse effect of proposed exploration activities on coastal and marine birds in the Chukchi Sea Planning Area are the same as those already discussed for the proposal.

CONCLUSION: The effects on coastal and marine birds could be moderate.

(e) Impact on Endangered and Threatened Species

This alternative will add one more sale to the proposal. Resource estimates will increase to 1501 Mbbls from 1152 Mbbls for the proposal. The number of platforms will increase by one and the number of exploration and production wells will increase by approximately 30 percent. These increases, however, would not cause a significant change in effects because these increases still result in a relatively low level of activity.

CONCLUSION: Effects will be the same as for the proposal, low.

(f) Impact on estuaries and wetlands

These topics are discussed and impacts analyzed where they occur as habitat for the fish and wildlife species in (4)(a) through (4)(f) in this section.

(g) Impact on areas of special concern

These areas are all habitat for the fish and wildlife species in (4)(a) through (4)(f) and impacts are discussed as they occur in the planning areas.

(h) Impact on marine sanctuaries

There are no marine sanctuaries in the Alaska OCS Region.

(3) Socioeconomic Environment

(a) Impact on employment and demographic conditions

Moving up the second sale by 1-year and adding a third sale would marginally increase the risk of negative effects on employment and demographic conditions. Even with a commercial discovery, most of the effects will occur in the form of 800 additional people in the State, mostly in Anchorage, which is capable of accomodating the increase. Increased employment opportunities and demographic effects would remain low on the North Slope.

CONCLUSION: Effects would be low.

(b) Impact on coastal land-use

This alternative projects a third sale within the Chukchi planning area and an increase of approximately 30 percent in the area's oil resources. This increase in resource potential as well as the addition of a single offshore platform should not appreciably alter land-use impacts from those projected for the proposed action. The increase in resources should not cause either increase in land required for pipeline right-of-way or a substantive change in the acreage required for processing facilities.

CONCLUSION: Impacts on land-use which may result from this alternative would not be appreciably different from those forecast for the proposal, moderate.

(c) Impact on commercial fisheries

There are no commercial fishing activities in the Chukchi Sea.

(d) Impact on recreation and tourism

Moving the proposed sale of year 1990 up 1-year will concentrate effects toward the front of the schedule, however, the impacts would not change from the proposal. The addition of 1 sale would not add substantially to tourist or recreation opportunity impacts because of their low level of activity.

CONCLUSION: The effects of this alternative are expected to be low.

(e) Impact on archaeological resources

By moving the proposed sale of the year 1990 up 1-year effects will be concentrated toward the front of the schedule, however the impacts would not change from the proposal. The addition of a sale, because all additional infrastructure (1 platform) would be in the ocean, would not disturb archaeological sites.

CONCLUSION: The effects of this alternative are expected to be very low.

(f) Impact on subsistence-use patterns

Moving up the second sale by 1-year and adding a third sale would increase the risk of negative effects on subsistence.

This alternative could add to the risk of oil spills, habitat loss, noise disturbance, and the reduction of wildlife throughout the affected areas. The safety of bowhead whales and the availability of these and beluga whales may become a growing concern. If major extensions of onshore facilities such as roads and pipelines occur, these proposals could have important area-wide effects on the distribution of land mammals and on access to important subsistence areas. This would be particularly significant with regard to caribou. However, no additional roads or pipelines are assumed other than those for the proposal. Effects on subsistence resulting from potential biological effects are not expected to exceed moderate; however, because of the primary roles of caribou and bowhead whales in the North Slope economy, moderate impacts on either or both of these species could result in major impacts on subsistence.

CONCLUSION: The overall effect on subsistence in the planning area would be moderate.

(g) Impact on sociocultural systems

Three lease sales in the area would almost assure that a service base would be designed for, and probably built in or near, Wainwright. Regular rotation of workcrews to and from the camp could have a number of disruptive effects on local Wainwright social systems. Increased interaction would probably have the biggest effect on youth of the village. However onshore infrastructure is not expected to expand because of this alternative.

CONCLUSION: Sociocultural effects would be moderate.

(h) Impact on transportation systems

The 30 percent rise in resources forecast in this alternative would increase developmental period enplanements by 10 percent and production period enplanements by nearly 25 percent. However, infrastructure impacts caused by additional hydrocarbon resources would not be substantively different than those of the proposal. Levels of traffic would be elevated in this case, but not to the degree that facilities of a magnitude greater than that forecast for the proposed action are expected. Thus, air, surface, and marine facilities constructed in response to activities associated with the resource level projected with this alternative would be similar to those of the proposal. Principal impacts would, as in the proposal, come in the form of transport infrastructure expanding into regions which have heretofore been largely devoid of transportation infrastructure.

CONCLUSION: Impacts of this alternative would be similar to those of the proposal, high.

(i) Impact on military uses

There are no restricted military use areas in the Alaskan OCS.

i. Alternative V - Acceleration Provision

The only difference between Alternative V and the proposal (Alternative I) is that the second proposed sale would be held in 1989 rather than 1990. The pre-lease process would not be shortened under this alternative. No new proposed sales would be added. There is no difference in oil and gas resource estimates. Post-sale activities would remain the same as the proposal. Exploratory, and if commercial quantities of oil or gas are found, development and production activities, could conceivably happen 1 year earlier than the proposal but not necessarily so.

Because of the extremely small difference between the proposal and this alternative, impact levels for all resource categories listed would not change.

j. Impacts of Alternative VI - Defer Leasing in Six Planning Areas: North Atlantic, Washington and Oregon, Northern California, Central California, Southern California, and North Aleutian Basin

Selection of Alternative VI would defer leasing in the North Aleutian Planning Area (Alaska Region). The result of selecting this alternative would be to reduce impacts in the affected planning area. It would have no effect on or change any of the assessed impacts in the Chukchi Planning Area.

k. Impacts of Alternative VII - No Action

Under this alternative, the Secretary of the Interior would propose not to schedule any oil and gas lease sales for this proposed 5 year program. All potential impacts from OCS oil and gas activities to the physical, biological, and socioeconomic environment resulting from hydrocarbon exploration, development, and production would be eliminated.

Oil and gas are currently the nation's primary energy source. Even with a vigorous conservation program the United States demand for energy will continue to grow. With the adoption of Alternative VII the oil and gas that would have been available as a result of this proposed program would no longer contribute to the national domestic production during the life of the program.

With the removal of the potential oil and gas into the national energy reserves, it would necessitate the increased production of energy from other conventional and non-conventional energy sources (See Appendix C), and/or increases in import levels from foreign sources. Impacts resulting from the development of the alternative energy sources are summarized in Section II.A.7 and discussed further in Appendix C.

21. Beaufort

a. Alternative I

The proposal includes the holding of two sales in the Beaufort Sea Planning Area. It is estimated that the sales will produce about 627 MMbbls of oil over a 35-year period. These resources will be produced from 61 production wells from 2 platforms. In addition to the oil, about 7.5 to 375 MMbbls of formation water will be produced. Approximately 155 thousand bbls of drilling muds and fluids and 344,000 bbls of drill cuttings could be discharged into the sea over the life of the proposal. About 22 exploration wells will be drilled. It is anticipated that one existing support base will be used. For a generic discussion of impacts, see IV.B.II.a(3), (4), (5).

(1) Interrelationships of Proposal with Other Projects and Proposals

Section IV.B.11.a(1) presents a discussion of the interrelationships of the proposal with other projects and proposals for all Alaskan planning areas.

(2) Projects Considered in Cumulative Impacts Assessment

The following activities will contribute to cumulative effects in the Hope, Chukchi, and Beaufort Sea Planning Areas.

The Prudhoe Bay Unit (PBU), a State of Alaska operations, produces 1.5 million bbls of oil per day from the Sadlerochit formation, approximately 17 percent of the total U.S. production. Approximately 4,000 persons are employed for this unit. Major facilities include base camps for Sohio and ARCO personnel, a crude oil topping plant, airstrip, flow stations, gas-injection facilities, two docks, seawater-treatment plants, water-injection plants, and a power system. Additional facilities for support activities have been located at Deadhorse.

The Lisburne field lies under the Prudhoe Bay Unit. Permits have been issued for expanding five onshore drill sites, roads, and gathering facilities. The sixth platform is offshore. ARCO plans to drill 180 wells on six pads for an initial production rate of 100,000 barrels per day in 1987.

The Kuparuk River oil field lies approximately 30 miles northwest of Prudhoe Bay. Oil in place is estimated to range from 4 to 5 billion barrels. Total recoverable oil with a successful waterflood is estimated at 1.6 billion barrels. A waterflood demonstration project began in 1983. Present rate of production is 190,000 barrels per day. Peak production of 250,000 barrels per day, expected in 1986, will make Kuparuk second only to Prudhoe Bay in U.S. daily production.

The West Sak formation lies within the boundaries of the Kuparuk Unit. ARCO is conducting a pilot project in the West Sak sand formation to determine the potential for full-scale production--up to 2,500 barrels a day could be produced during the pilot project. Eight wells are used in this project to produce oil. In December 1984, the COE issued a permit under section 10 of the River and Harbor Act of 1899 and section 404 of the Clean Water Act to Sohio Alaska Petroleum Company for the Endicott Development Project.

Work permitted includes construction of two gravel islands approximately 2.5 miles offshore and 15 miles east of Prudhoe Bay; a 3.1-mile solid-fill gravel causeway connecting the two drilling islands; a 1.9-mile gravel causeway with 700 lineal feet of breeching extending from the Sagavanirktok (Sag) River Delta to the interisland causeway; a 1.5-mile gravel causeway approach through the Sag Delta and an 8.7-mile gravel road through Sag Delta wetlands that would intercept with the existing Prudhoe Bay road system at Drill Site 9; elevated oil pipelines along the onshore road segments to TAPS Pump Station 1; and an onshore disposal pit to contain drilling effluents determined to be unsuitable for offshore disposal.

Conoco operates Milne Point, an (approximate) 21,000-acre field that is located north of the Kuparuk River Unit. The field was identified by Conoco in 1970 but was not considered economic to develop until 1979 when the area was unitized. Delineation of the Milne Point field is complete. An 11.5-mile, 14-inch pipeline was built between the Milne Point field and the West Kuparuk pipeline. Production from 24 wells located on two pads should begin in January 1986 at 30,000 barrels a day. Conoco expects to maintain that level of production throughout the life of the field.

Several gas fields contain reserves which could be recovered, should the infrastructure for transporting the gas be constructed. Two fields which fall in this category already are associated with oil production. Estimates for gas from the Prudhoe Bay gas cap indicate 2 billion cubic feet per day could be extracted for 25 years without substantially affecting the production of oil. Proven reserves total 28,183 billion cubic feet. Estimates of gas reserves at Endicott indicate initial production could reach 250 million cubic feet per day for 20 to 30 years.

Seal Island is constructed on a lease obtained by Shell during the Joint Federal-State Beaufort Sea Lease Sale held in 1979. Recovery of 300 million barrels of oil at 5,000 barrels per day has been estimated from a discovery announced by Shell in January 1984. Shell would like to start producing about 100,000 bbls of oil per year possibly by 1992. Delineation of the Northstar western portion of the structure begins in fall 1985. Up to 5 wells may be drilled over the next 2 years (OGJ, 83:31:78).

The National Petroleum Resource-Alaska (NPRA) is administered by the Department of the Interior. Reserves are estimated at 6.4 billion barrels of oil and 11 trillion cubic feet of gas; recoverable reserves are estimated at 1.85 billion barrels of oil and 3.74 trillion cubic feet of gas.

In 1982, Dome Petroleum Limited; Esso Resources Canada, Limited; and Gulf Canada Resources, Inc., prepared a Beaufort Sea-Mackenzie Delta EIS. This description summarizes the information found in the Sale 87 FEIS (USDOI, MMS, 1984) which was based on information from Dome Petroleum Limited, et al (1982), EIS: Alaska OCS Region Technical Paper No. 7 (Roberts and Tremont, 1982); and the Beaufort Bulletin, June 1983.

According to its EIS, Canadian industry anticipates four offshore and three onshore reservoirs should be on line during the years of hydrocarbon production. For oil and gas exploration, delineation, production, and injection, 655 additional wells are expected. Between 1987 and 2000, the work force will increase gradually to approximately 8,500 persons. Construction of a gas pipeline between 1989 and 1992 could employ 10,000 persons and would peak in 1990. The figures used for the 1982 EIS for Canadian development are based on the confirmation of a commerical field by 1983 or 1984, production beginning as early as 1986 or 1987, and a minimum estimated reserves of between 6.3 and 32 billion barrels of oil and a production rate of 700,000 barrels per day. To date, industry has not announced a commercial field, and reserve estimates have been adjusted to 9.2 billion barrels, a production rate of 375,000 barrels per day (Energy Daily January 30, 1984). As a result, the dates used for the EIS should be adjusted by a minimum of 2 years into the future and the level of activity should be reduced.

The Arctic Slope Regional Corporation (ASRC) is a for-profit corporation created pursuant to the Alaska Native Claims Settlement Act of 1971. The ASRC has title to 4.9 million acres, both surface and subsurface estate, located in the northern part of the State. The ARSC lands are located principally to the west and to the south of the NPRA boundaries. The ASRC has leased approximately half its acreage to various oil companies (William Thomas, ASRC, personal communication, May 1985). The ASRC lessees have drilled in the Arctic National Wildlife Refuge (ANWR) and Gubik, east of the NPR-A.

The State of Alaska Sale 34 was held in May 1982 for acreage in the Prudhoe Bay uplands. The lease area straddled the Arctic Slope and Northern Foothills petroleum provinces.

The State of Alaska Sale 36 was held in September 1982. Acreage offered equalled 56,862 acres--41,500 acres were submerged lands north of Prudhoe Bay near Midway Islands and approximately 15,500 acres included both submerged lands in the Flaxman Island-Canning River area and uplands along the northwest border of the ANWR.

The State of Alaska Sale 39, held in May 1983, was for 211,956 acres between the Colville River Delta and Gwydyr Bay.

The State of Alaska Sale 43, held in May 1984, offered tracts immediately west of Sale 39. Sale 43A, offering nine tracts at the mouth of the Colville and six tracts much further south, was held concurrently. All tracts, except three offshore, received bids.

In May 1985, the eastern portion of the Kuparuk uplands was offered in the State of Alaska Sale 47. This area includes approximately 600,000 acres between the Kuparuk and Sagavanirktok Rivers. Petroleum potential is considered moderate to high.

READEX FICHE

Seven future State of Alaska lease sales in the Beaufort Sea and mid-Beaufort uplands and one reoffering are included in the State of Alaska's 5-Year Lease Sale Schedule (State of Alaska, DNR, 1985). Offerings in the Beaufort Sea coastal area are considered to have moderate to high resource values.

Sales that would be held because of the proposed 5-Year schedule could, if oil and gas are produced, cause cumulative effects to the ongoing program.

(3) Physical Environment

(a) Impact on water quality

Refer to Section IV.B.11.a(3) in this document for details on general effects to water and air quality in the Alaska Region that may occur as a result of oil and gas activities associated with the proposal.

In the Beaufort Sea, dredging and gravel island construction for two possible platforms would each appreciably but temporarily increase turbidity over a limited area. Platform discharges of drilling fluids (muds, 155,000 bbls and cuttings 344,000 bbls) during exploration and production subsequently recontaminate about 1 percent of the same areas. Production, but not exploratory discharge, would continue intermittently over several years (peak activity between 1999 and 2001). Two oil spills of 1,000 bbls or greater could significantly, but temporarily, increase the water column hydrocarbon concentration over several hundred kilometers. Significant long-term impacts on regional water quality are very unlikely for the proposed action. Short-term impacts on regional water quality are very unlikely for the proposed action. Short-term and local impacts are very unlikely.

CONCLUSION: Water quality impacts would be low.

CUMULATIVE IMPACTS: Cumulative effects on water quality in the Beaufort Sea Planning Area and adjacent State waters may be caused by additional offshore projects in the eastern Chukchi Sea and the Beaufort Sea (see IV.B.21.a.(2)). The Federal and State offshore oil and gas development would increase water quality impacts from dredging, construction of artificial islands and causeways, and platform discharges from three platforms.

Consideration of oil and development in Federal, State, and Canadian waters could cause a similar increase in the number of estimated oil spills from two to four, but one or more of these spills could occur in Canadian waters. Existing land-based oil industry development will not appreciably affect marine water quality. Cumulative water quality impacts will, thus, remain low.

Conclusion: Long-term impacts on water quality would still be low.

(b) Impact on air quality

In the Beaufort Sea, air quality standards are very unlikely to be exceeded. Incremental increases from two possible platforms in atmospheric sulfur and particularly nitrogen oxide concentrations--and consequently in their deposition rates within the study area are possible.

Increases in acid precipitation are unlikely to cause damage either locally or regionally.

With one exception, impacts on air quality from the proposal are expected to be insignificant. No violations of any national or State air quality standards or of U.S. EPA Prevention of Significant Deterioration (PSD) requirements are anticipated. However, federal review and modeling commensurate with the PSD review process will be required for any facilities. Such facilities may include: base camp and crew quarters, airstrip, dock and harbor, pump station, storage area, helicopter pad, access roads, and a marshalling area near the dock. The air quality of the Beaufort Sea coast is good but not pristine. Nitrogen and sulfur oxide emitted from projected oil activities would be the only frequent pollutants with obvious potential environmental consequences. Very rarely could in situ burning of the estimated 2 oil spills over 1,000 bbls temporarily degrade air quality. Air quality would remain good and within statutory requirements, but the incremental degradation of quality that would occur could impact coastal tundra (but not marine) ecosystems.

Air quality standards are very unlikely to be exceeded. Incremental increases in atmospheric sulfur and particularly nitrogen oxide concerntrations--and consequently in their deposition rates within the planning area--are very likely. Increases in the nitrogen budget of coastal tundra attributable to the proposal could influence speciation and plant succession in unknown ways. The likelihood of such influence occurring is unclear.

The increases in acid precipitation projected for the proposal are very unlikely to cause damage either locally or regionally. In situ burning of oilspills is very unlikely to cause damage, and any damage would be local and short-term.

Conclusion: Direct effects to air quality from the proposal are low.

CUMULATIVE IMPACTS: Air quality degradation caused by pollutant emissions from existing onshore and offshore oil and gas leases along the Beaufort Sea coast would likely be greater than that anticipated from the proposal. In situ burning of four estimated oil spills could be expected. It is still very unlikely that State or Federal air quality standards would be exceeded. Deposition of nitrogen and sulfur derived from existing leases and the proposed action could be significantly greater than that derived from the proposal alone.

CONCLUSION: Cumulative impacts would therefore be low.

(4) Biological Environment

(a) Impact on plankton and benthos

Extensive reviews of the effects of petroleum hydrocarbons on planktonic and benthic organisms have been provided by Johnson (1977) and Environmental Sciences, Limited (ESL, 1982). Further, the observations of effects on planktonic and benthic communities following several major spills have been reviewed and summarized by Duval et al. (1981). Two estimated oil spills, drilling discharges (155,000 bbls of muds and 344,000 bbls of cuttings), formation water discharges (7.5 to 375 mbbls), dredging and construction activities (for two platforms) would affect planktonic communities.

Short-term effects would include declines in abundance and diversity of planktonic organisms resulting from acute and chronic lethal and sublethal toxic responses to oil discharges and turbidity plumes that are created by dredging and construction operations. Long-term effects would result from long-term changes in temperature, salinity and/or circulation patterns around islands and causeways, and the long-term discharge of formation waters during production. It is anticipated that the 2 proposed sales would produce about 627 million barrels of oil, and no gas from 2 platforms.

All of the effects on planktonic communities would be highly localized. Less than one square kilometer of planktonic habitat could be affected by discharges during exploration and development. As much as 10 square kilometers of habitat could be affected as as result of each turbidity plume from dredging. A similar relatively small amount of planktonic habitat would be affected by two spills of 1,000 barrels or greater that could come from the proposal. These effects would be considered low.

Effects on planktonic and epontic (under-ice) communities under the winter ice cover would be similar to those discussed above the plankton. The areal extent of these effects, however, would be even smaller. Therefore, effects on epontic life would also be low.

Effects on benthic communities are also very unlikely if the proposal is implemented. Short-term effects would include declines in abundance of benthic organisms resulting from drilling fluid discharges and habitat alterations from dredging. Long-term effects would result from responses to oil spills, discharges of drilling fluids and formation waters during development and production, as well as permanent temperature, salinity, and circulation changes due to the physical presence of islands and causeways.

Effects from all activities or agents except oil spills would be considered low. Discharges of drilling fluids from platforms could affect about 360 hectares of benthic habitat during exploration and an even smaller amount during development. Discharges of formation waters from each production platform could affect up to 1,570 hectares during development and production. Dredging and constuction could cause physical disturbance and turbidity affecting about 1,990 hectares of benthic habitat.

Oil spills could result in moderate local effects on benthic habitat, although the likelihood is remote. Vast areas of nearshore (intertidal or subtidal) and backshore (delta or marsh) benthic habitats could be contaminated by an estimated 2 oil spills of 1,000 bbls or more, and produce lethal and sublethal effects on benthic organisms that persist for years, assuming an inadequate cleanup of oil. In more sheltered areas, such responses could persist for decades.

CONCLUSION: Implementation of the proposal would result in low effects on planktonic and benthic organisms on regional populations and moderate on local populations.

CUMULATIVE IMPACTS: Proposed and existing oil and gas development and leasing could result in cumulative or additional effects on planktonic and benthic organisms of the Beaufort Sea region. The proposed and existing leasing includes Federal and State offshore oil and gas leasing and transport of Canadian oil produced in Canada through the planning area. These activities would provide a greater number of sites (3) (as compared to the proposal, 2 platforms and a pipeline) from which oil spills could occur (4 assumed).

The likelihood of a spill occurring during conditions that would promote incorporation of oil into sediments over a large area is increased with State of Alaska leasing. Moderate effects are, therefore, likely for nearshore benthic communities in the cumulative case as compared to low for the proposal.

In summary, the cumulative effects on planktonic and benthic organisms of the Beaufort Sea region would be greater than the proposal in terms of the number of sites from which effects would occur. Most of these effects would not exceed low, which is essentially the same as the proposal. This conclusion results from the relatively localized and/or short-term nature of most effects resulting from causal agents discussed above. Exceptions would be effects on benthic organisms produced by large oil spills discharged into low energy habitats. These latter effects could be moderate.

CONCLUSION: Cumulative impacts to planktonic and benthic organisms are expected to be moderate.

(b) Impact on fish resources

Fish resources of the planning area would likely be affected by oil spills, discharges of drilling effluents, and dredging and construction activities that would be expected if the proposal is implemented. The magnitude and duration of these effects would vary for each of the above causal agents. Refer to Section IV.B.11.a(4) in this document for a generic discussion of impacts on fish resources that may occur in the Alaska region as a result of oil activities associated with the proposal.

The toxicity of muds to Alaskan fish species has been reviewed by Jones and Stokes Associates, Inc. (1983). Few studies have been performed on the toxicity of formation waters (Menzie, 1982). Rice et al. (1981), examined the toxicity of ballast water treatment effluent on marine organisms at Port Valdez, Alaska.

Two estimated oil spills would produce a variety of lethal and sublethal responses in fishes occurring in the planning area. These effects, however, are not likely to exceed low, considering the low toxicity of oil, the low concentrations of oil associated with sticks, and the relatively broad distribution of fish. Moderate effects on fish populations could occur under certain conditions; however, simultaneous occurrences of these conditions and oil spills contacting important nearshore areas are very remote.

The construction of gravel causeways could provide a potential adverse effect on regional populations of anadromous fish. Studies of the Prudhoe Bay causeway showed that a deflection of the longshore current offshore was instrumental in altering the temperature and salinity around the causeway. With the prevailing northwest winds, temperatures on the west side would be 2 to 4 degrees cooler, while salinties would increase by 10 parts per thousand (Bendock, 1979; Mungall, 1978). Although these differences are well within the range of fluctuations frequently observed in the study area (Craig and Haldorson, 1981), they might affect fish.

Currently, cumulative impacts of a causeway should be treated as unknown. Studies by Fechhelm and Gallaway (1982) show that a least one important anadromous species, the arctic cisco, exhibits a definite temperature preference which relates positively to its distribution along the coastline. By modeling movements and distribution of arctic cisco relative to changes in temperature and salinity around the Prudhoe Bay causeway, Neill et al. (1982), estimate that a slight reduction (about 7 percent) in fish density occurs in the area of less preferable conditions (lower temperatures and higher salinities). Additionally, these causeway-induced changes could pose migration and movement "barriers" to those species that require less saline conditions (broad and humpback whitefish).

It is important to note that causeway construction is regulated by a permitting process administered by the COE under section 404 of the Clean Water Act. Under this process an enviromental assessment would be made of several site- or design-specific alternatives, thus allowing the most environmentally preferred alternative to be identified.

Impacts on fish resources from drilling discharges would be very local and very low in both the short and long term. This is due to the low toxicities of drilling effluents (155,000 bbls of drill muds, 344,000 bbls of cuttings, and 7.5 to 375 Mmbbls of formation waters), rapid dilution and dispersion of drilling fluids, and low densities and mobile behavior of marine fish in this region.

The two oil spills estimated from this proposal could produce a variety of lethal and sublethal responses; however, these effects would be low due to the relatively low concentration of oil in the water column associated with oil slicks and the relatively broad distribution, low density, and high mobility of arctic fish populations.

Oil spills affecting critical overwintering areas could, under certain conditions, produce moderate effects to anadromous fish populations; however, such an occurrence is very unlikely. Effects from dredging and drilling discharges would be very low because of (1) the low toxicities and rapid dilution and dispersion of drilling fluids and suspended sediments and (2) the low densities and high mobility of arctic fish. Several causeways located along the coastline could produce adverse impacts on anadromous fish populations. The magnitude of their impacts is unknown but would be assessed in site-specific environmental assessments at the development and production stage and in at least one EIS for development/production plans in the area.

CONCLUSION: Impacts on fish resources are expected to be low regionally and moderate locally.

CUMULATIVE IMPACTS: Proposed and existing oil and gas development and leasing would result in cumulative or additional effects to the fish resources of the region. These existing or proposed activities (one additional platform) include both onshore and offshore State and Federal oil and gas leasing in the Beaufort Sea region, and tankering of oil produced in Canada through the planning area.

Causal agents for onshore effects include construction activities, oil spills, water withdrawal, and water pollution. Only low effects are anticipated due to adequate regulatory requirements imposed during permitting of site-specific operations.

Offshore leasing would increase the number and the temporal and spatial dimensions of the causal agents discussed for the proposal. Discharges and dredging operations would still promote only local short-term, very low effects. The cumulative effects of the addition of causeways from development of state offshore leases, such as the proposed Endicott Development, are unknown.

The number and likelihood of oil spills occurring would increase significantly in the case of additional State leases. The probability of moderate impacts would be likely as compared to very unlikely for the proposal alone (see Section IV.B.21.a.(2)).

CONCLUSION: Cumulative effects to fish resources are expected to be moderate.

(c) Impact on Marine Mammals and Caribou

Six species of nonendangered marine mammals--ringed, bearded, and spotted seals; Pacific walrus; polar bear; and beluga whale--commonly occur in a portion of or throughout the Beaufort Sea Planning Area and are very likely to have some interaction with OCS industrial activities. Oil pollution and disturbance due to increased human activity and alteration of habitats could adversely affect marine mammal populations found in the planning area. The general effects of oil spills, noise and disturbance, and habitat alterations on marine mammals are discussed in Section IV.B.11.a(4), Impact on Marine Mammals in the Gulf of Alaska Planning Area.

Approximately 40,000 to 80,000 ringed seals, an estimated 45,000 bearded seals, 12,000 walruses, and 1,000 to 3,000 spotted seals occurring seasonally or year round in the Beaufort Sea Planning Area are the marine mammal populations at risk from potential oil spills that may be associated with the proposal.

Two potential oil spills greater than 1,000 barrels over the life of the proposal pose the greatest risk to marine mammals in the Point Barrow offshore area and in the Harrison-Prudhoe Bay offshore ice-flaw-zone habitat. Aggregations of ringed and bearded seals occur in these habitats and could be contaminated, but few pupping and breeding ringed seals are likely to be contaminated by a winter oil spill. Polar bears would be most vulnerable to oil spills in the ice flaw zone; however, few bears are likely to be affected due to their sparse distribution. Walrus herds and their seasonal feeding habitat west and north of Point Barrow are at considerable risk of oil spill contact. Healthy walruses are not likely to die from oil spill contact. In a severe event, however, contamination of benthic food sources and feeding habitats could reduce winter survival of several animals the following year and possibly reduce herd productivity. This would probably cause a low impact on the population as a whole. Beluga whales are most vulnerable to oil spill contact during spring migration off Point Barrow. The western Beaufort Sea population of belugas is likely to have some contact with hydrocarbons in the water column or on the surface if an oil spill contaminates the lead system off Point Barrow. However, few beluga whales are likely to be seriously affected by brief exposure to the spill. Ringed seal pups and polar bears are species most likely to suffer direct mortality from oil spills. A small number of ringed seals, perhaps 75 to 100 pups and highly-stressed adults and a few polar bear could die if a spill occurred. This would represent no more than a low effect on the populations.

Present knowledge of the behavior of nonendangered marine mammals and the nature of noise associated with offshore oil and gas activities suggest that intense noise causes brief startle, annoyance, and/or flight responses in the marine mammals. However, such responses are highly variable. Noise and disturbance from air traffic associated with the proposal could have the greatest effects on walrus nursery herds hauled-out on the ice while present in the lease sale area during the summer. Disturbance from low-flying aircraft could result in injury or death to walrus calves when the adults stampede into the water. This would likely have a low effect on a portion of the calf population since such disturbance is expected to be infrequent. Aircraft disturbance effects on other marine mammals are likely to be low.

Noise and disturbance from marine vessel traffic associated with the proposal through the primary lead system could temporarily interfere with the migration of some marine mammals, particularly beluga whales, near the ships. However, marine traffic is not likely to block or greatly delay marine mammal migrations. Severe ice conditions are certain to have far greater influence on spring and fall migrations than vessel traffic associated with oil exploration and development. Seismic boats and other marine traffic that may occur near Elson Lagoon and other coastal areas could displace or interfere with spotted seal use of these important habitats. Overall, noise and disturbance effects on marine mammals are not likely to exceed low, with effective enforcement of regulations under the Marine Mammal Protection Act. Effects of dredging and offshore and onshore construction are likely to have low effects on marine mammals with disturbance subsiding after construction is complete.

Industrial noise may have several other potential effects such as masking pinniped communication and interfering with whale echolocation. It is unclear whether these effects would occur or if marine mammals could adjust to industrial noise. However, the continued presence of dolphins, porpoises, and seals in coastal marine habitats with high levels of industrial activity and continuous marine traffic strongly suggests that nonendangered marine mammals are able to adjust to man-made noise and disturbance. Present knowledge on marine mammal behavior in association with industrial noise sources suggests that effects of disturbance on nonendangered marine mammals are likely to be low.

CONCLUSION: The effects from activities associated with the proposal on ringed seals, polar bears, and pinnipeds would be low and would be very low on beluga whales.

CUMULATIVE IMPACTS: The additive effects of other ongoing and planned projects (one additional platform), as well as the proposal, on nonendangered marine mammals are discussed in this section. Although the probability of any or all planned and ongoing projects reaching developmental stages is generally unknown, this analysis assumes that all area projects do reach developmental stages. These projects could affect marine mammals by oil spills, noise and disturbance, and habitat alteration.

Cumulative oil and gas activities of the Beaufort Sea area and other offshore and onshore projects (see Section IV.B.21.a(2)) would subject marine mammals and their habitats throughout the Beaufort and Northern Chukchi Seas to a variety of aggregate effects. Potential oil spills from offshore oil activities could have the most noticeable effects on pinnipeds; perhaps, several thousand pinnipeds and small numbers of polar bears could be contaminated as a result of oil spills over the life of these projects. However, these species are likely to suffer low mortality rates from oil spill contamination, with only very young seal pups, a few polar bears and walrus calves, and perhaps highly stressed adults dying from the contamination. These effects are likely to be low to marine mammal populations. Cumulative oil spills would probably have low effects on pinniped and polar bear populations, and very low effects on begula whales which are not likely to be seriously affected by oil spills (see above discussion under Section IV.D.11.a(4)). Regional populations of marine mammals are likely to replace the small numbers of individuals lost to oil spills within less than one generation.

Cumulative noise and disturbance of breeding ringed seals from on-ice seismic surveys would probably have low effects on ringed seals since only a small percentage of the population are likely to be affected per year, and even a smaller number of pups are likely to be lost due to adult abandonment of maternity lairs on an annual basis. Noise and disturbance of beluga whales during spring migration from cumulative ice breaker and vessel traffic could have low to moderate effects on the whales if spring migration of a portion of the whale population were often delayed due to frequent vessel traffic in the ice lead system. Cumulative noise and disturbance effects on the marine mammals occurring in the Beaufort Sea are likely to be low, although moderate effects on polar bears are possible if all coastal denning areas in Alaska were abandoned because of noise and human presence near denning areas.

CONCLUSION: Cumulative oil and gas exploration, development, and production from the above projects and the proposal would have low effects on nonendangered marine mammals occurring in the Beaufort Sea.

Impacts on Caribou: The primary potential effects of OCS activities on caribou would come from onshore support and development activities adjacent to the planning area. It is assumed that this proposal will result in one new onshore pipeline and an expansion (on extended use) of one existing pipeline land fall and one existing support base.

Human disturbance of caribou and habitat changes are the primary concerns. Human activities can cause temporary and possibly permanent displacement of caribou, particularly cows and calves, from important habitats such as calving grounds, insect relief areas, and preferred feeding habitats. Recent studies indicate significant seasonal avoidance of the northern portion of the Alaskan pipeline corridor/haul road and the Prudhoe Bay area by cows and calves during calving and post-calving periods (May-August). Caribou can be greatly disturbed by low-flying aircraft, fast-moving ground vehicles, and other human activities. The response of caribou to potential disturbance is highly variable--from no reaction to violent escape reactions--depending on their distance from human activity, speed of approaching disturbance source, and frequency of disturbance; sex, age, and physiological condition of the animals; size of the caribou group; and season, terrain, and weather. Cow and calf groups appear to be most sensitive, especially during the summer months, while bulls appear to be least sensitive during that season.

Habituation to aircraft disturbance and other human activities are thought to have occurred in several studies of hoofed mammal populations in North America. The variability and instability of arctic ecosystems dictate that caribou have the ability to adapt behaviorally to some environmental changes. Consequently, repeated exposure to human activities such as oil and gas exploration may lead to habituation. Bulls in the central arctic herd have apparently demonstrated this ability. However, when certain sources cause instinctive avoidance reactions, flight responses may be so strongly engrained in the animals' behavior that adaptation to the disturbance source is very slow or impossible. Small groups of caribou that overwinter in the vicinity of Prudhoe Bay and NPRA being continually exposed to disturbance stimuli have apparently adapted to human activities, while the majority of the caribou herds on the North Slope which overwinter further inland are less likely to adapt to human activities to which they are seasonally or intermittently exposed. It is not known whether displacement or avoidance by caribou of coastal habitats near Prudhoe Bay, or along the coast of the Beaufort Sea, could significantly affect herd productivity and result in a long-term population decline. However, displacement of the Central Arctic caribou herd (more than 6,000 animals total population) from a portion of the calving and summer range has occurred.

Alteration of caribou coastal habitats may occur. Construction of expanded gravel roads and processing facilities, and gravel mining for drilling platforms (2) and onshore pipelines would alter or eliminate some caribou habitat on the North Slope. The possible construction of an onshore pipeline to the TAPS terminal could alter some additional caribou habitat.

If a spill (two estimated during the life of the proposal) occurs during the open-water season, caribou frequenting coastal habitats such as in the Cape Halkett or Jones Islands areas could possibly be directly exposed to oil along the beaches and in shallow waters during the periods of insect-pest escape activities. Caribou may ingest oiled vegetation along contaminated shorelines in these areas. The number of caribou that are likely to be affected would probably be small in comparison to the number of caribou that range along the arctic slope adjacent to the proposal. As oil and gas development displaces caribou from calving ranges, as is apparently occurring in the Kuparuk River and may occur in the Canning River delta areas, range-carrying capacity may decline leading to reduced caribou productivity. Therefore, onshore oil and gas development activities associated with the proposal may have adverse effects on the arctic caribou herds.

The FEIS for Sale 87 (USDOI 6/84) contains an expanded discussion of impacts of offshore oil development on caribou. The probability of commercial oil discoveries in the eastern, western, and far western parts of the Beaufort Sea is uncertain as are the locations and routes of oil transportation and support facilities.

CONCLUSION: The effects of oil and gas exploration alone on caribou are likely to be low. However, oil development in the lease offering area is likely to have moderate local effects on caribou.

CUMULATIVE IMPACTS: Cumulative noise, disturbance, and habitat alteration from present onshore construction activities, vehicle traffic, and human presence over a 360-square-mile area have apparently displaced caribou calving and post-calving cows/calves from the Prudhoe Bay area. However, the present level of industrial activity on the North Slope has apparently not affected caribou herd productivity.

The aggregate area included in the projects considered in the cumulative case (Section IV.21.a(2)) covers essentially the entire calving range of the Central Arctic herd and a major portion of the summer range. Several hundred square miles more of caribou calving habitat and summer range could be affected by development, and further displacement of caribou could occur when industrial development increases from these projects. Unless cows and calves habituate to noise, land vehicle traffic, roads, and construction activities on their calving range, further displacement of calving activities along the coast from the Colville to the Canning Rivers is likely to occur. The additive displacement of caribou and increased loss of habitat from roads, gravel pads, quarries, and facility sites could eventually reduce range-carrying capacity and herd productivity.

However, a measurable reduction in caribou populations as a result of development may not be apparent for several years after substantial displacement and habitat loss has occurred.

Overall cumulative onshore oil and gas activities associated with the Cumulative case projects including the proposal would have some cumulative effects on all caribou herds that use the Arctic North Slope coastal habitats as summer and calving ranges. The Central Arctic herd has been displaced from calving areas near Prudhoe Bay to adjacent coast and upland calving habitat due to disturbance and perhaps due to habitat alterations. This herd's entire calving range is likely to be exposed to development from several of the above projects.

Because caribou cows and calves have not evidenced significant adaptation to increasing industrial activities, vehicle traffic, and human presence on their calving range, further displacement is likely to occur as development proceeds. Future cumulative oil and gas activities on the NPRA and possible cumulative oil development activities on ANWR could have major effects on caribou.

Conclusion: Cumulative effects of the above projects including the proposal on caribou could be high.

(d) Impact on coastal and marine birds

The effects of an oil spill (two estimated for the proposal) on birds in the Beaufort Sea area would vary with the season; volume, nature, and duration of the spill; species and numbers of birds occurring in the areas affected; and many other variables. Spills that occur during the winter would have no immediate effects on birds. However, oil that remains in the ice after winter cleanup efforts may directly affect birds during the following spring breakup period or indirectly affect them through changes or reductions in food source availability. Oil spills that occur or melt out during spring breakup, or during the open-water period are likely to have immediate effects on some birds. Species most likely to suffer direct mortality would be sea ducks, specifically oldsquaw and eiders. Depending on the timing and areas contacted by the spill, other birds such as phalaropes, loons, brants, and other waterfowl may also be directly contaminated by oil that contacts leads in ice during spring or contacts coastal marshes or lagoons during the summer-fall feeding periods. In the above cases, several hundred to several thousand birds may be directly killed. Birds that are likely to avoid direct mortality from an oil spill, such as gulls and terns and other birds that may survive partial oiling, could incur various pathological effects from oil ingestion and reduced productivity from egg or chick mortality or displacement from local habitats.

Adverse effects from the proposal on marine and coastal birds would come primarily from oil spills (2 spills of 1,000 bbls or more are assumed), human disturbance of bird populations, and alteration of marine and terrestrial habitats associated with exploration and development. Oil spills that contaminate one or more coastal habitat areas or an important pelagic habitat could result in the death of several hundred or more birds. If a summer concentration area is widely contaminated, several thousand birds may be killed. Some contaminated habitats may adversely effect the available foraging resources of other regional birds populations which depend on these areas for food during migrations. The probability of this occurring is low, except during heavy ice years followed by a short and limited open-water season. High bird mortality in the Beaufort Sea due to an oil spill would not likely result in a long-term population decline because natural recruitment would probably replace losses of abundant species within 1 or 2 years. Birds species with low regional populations and low reproductive rates are not likely to suffer high mortality due to an oil spill in the Beaufort Sea. Impacts of two estimated oil spills on marine and coastal birds are likely to be moderate.

Disturbance of marine and coastal birds would come from low-flying aircraft, boats, and human presence. Sensitivity of birds to these disturbance sources is highly variable. Industrial activities associated with the proposal, such as a pipeline and marine traffic, are likely to disturb some local populations of nesting, feeding, and molting birds on barrier islands, lagoons, and tundra habitats. However, nesting activities of most species of marine and coastal birds are widely dispersed over the coastal tundra, and disturbance of local nesting birds would probably have little effect on North Slope bird populations as a whole. Overall, effects on birds due to disturbance are likely to be low.

Other industrial activities that would disturb birds include dredging, island and causeway construction offshore, gravel mining, fill storage and transportation, and pipeline and road development onshore. Offshore construction and dredging activities would temporarily displace some birds near the activity sites and temporarily disrupt or remove food sources near the island, causeway, pipeline, and dredging sites. Onshore construction activities would destroy or alter some tundra nesting and feeding habitat or marine and coastal birds. The permanent loss of important habitats from facility construction, pipelines, roads, and gravel mining during the development phase are primary concerns. Effect on birds from offshore and lnshore industrial activities (see Sections IV.B.21.a. and IV.B.21.a(2)) are likely to be low.

CONCLUSION: The impacts of oil development on coastal and marine bird populations are likely to be moderate.

CUMULATIVE IMPACTS: Ongoing and proposed oil and gas activities (up to three platforms) in the Beaufort Sea and nearby coastal areas would subject marine and coastal birds and their summer habitats throughout the North American arctic to a variety of aggregate effects. Potential oil spills from OCS activities could have the most noticeable short-term cumulative effects on birds. Several thousand birds could be killed as a result of oil spills over the life of these projects. Combined onshore oil and gas activities proposed and ongoing in Prudhoe Bay, the NPRA, the ANWR, and the Canadian Mackenzie River delta could have long-term effects on marine and coastal birds if several tundra nesting and feeding areas were destroyed or made unsuitable for successful reproduction. Cumulative oil and gas exploration, development, and production along the arctic coast and in the Beaufort Sea could have high effects on marine and coastal birds.

CONCLUSION: Cumulative oil and gas exploration, development, and production could have high impacts on marine and coastal birds.

(e) Impact on endangered and threatened species

Only two endangered whale species are found in the planning area--the bowhead and, infrequently, the gray whale. The threatened arctic peregrine falcon nest along several of the inland rivers. There are no listed plant species in areas adjacent to the planning area. Refer to Section IV.B.11.a(4) in this document for details on effects to endangered and threatened species that may occur as a result of oil and gas activities associated with the proposal.

There is a 70 percent probability of discovering 627 MMbbls of oil speculated to be in the planning area. It is expected that up to 22 exploratory/delineation wells and up to 61 development/production wells will be drilled from 2 platforms. Two oil spills are estimated to occur during the life of the field. All oil may be piped to a new land-fill base at Oliktok Point. Depending on the location of the platforms, the pipeline could bisect the whales' migration route. A winter spill has the potential to be released during breakup in a relatively unchanged state. Bowhead baleen has been shown to have reduced water flows when contaminated by oil which generally lasted less than 1 day.

To allow for year-round drilling, ice breakers will be associated with the platforms to move ice. Bowheads react strongly to vessels that approach within 3 to 4 km. Noise from the breakers will be disturbing due the erratic movements involved in ice breaking. Bowheads seem to be more easily disturbed by noise during the migration than when they are feeding during the summer. Noise produced by oil and gas activities could interfere with the timing and location of the migration through the Beaufort Sea. Gray whales seldom migrate past Point Barrow, and, therefore, it is unlikely that they will interact with the proposed oil and gas activities.

A formal section 7 endangered species consultation of MMS and NMFS and the FWS was conducted for the proposed Sale 87, Diapir Field Planning Area. The biological opinion from the FWS was dated 7/15/83 and covered Arctic peregrine falcons. The biological opinion from NMFS is dated 12/19/83 and covered endangered whales.

See Chapter V for a further description of the consultation process for section 7 of the Endangered Species Act of 1973.

CONCLUSION: Effects of oil and gas activities are not expected to exceed moderate for bowhead whales and low for gray whales and the peregrine falcon.

CUMULATIVE IMPACTS: As the whales pass through the various planning areas, there is an increased risk of exposure to oil spills, support traffic, pipeline construction, and ice-breaking vessels. Displacement from preferred habitats will be the most detrimental on a long-term basis. Abandonment of areas and reduced fecundity rates may also result from these situations overall. Separation of cow and calf pairs during migration may result in the death of calves.

CONCLUSION: Effects to bowheads are expected to be moderate and low for gray whales and peregrine falcons.

(f) Impact on estuaries and wetlands

These topics are discussed and impacts analyzed where they occur as habitat for the fish and wildlife species in (4)(a) through (4)(f) in this section.

(g) Impact on areas of special concern

These areas are all habitat for the fish and wildlife species in (4)(a) through (4)(f), and impacts are discussed as they occur in the planning areas.

(h) Impact on marine sanctuaries

There are no marine sanctuaries in the Alaska OCS Region.

(5) Socioeconomic Environment

(a) Impact on employment and demographic conditions

The search for and discovery of oil and gas within the Beaufort Sea Planning Area could create employment opportunities and, consequently, increase population levels. These changes have both positive and negative attributes, thereby giving an indication of the socioeconomic well being of communities, the State, or regions with the State.

This proposal could generate a regionwide total of about 90 to 950 jobs during peak activity. This is based on estimates made in past EIS's for the Alaska OCS Region for similar activites in similar areas. The bulk of the jobs (perhaps 90+percent) will be filled by workers living in enclaves near the job site.

The general pattern is one of small employment effects in the exploration phase and fairly large effects during the development phase (starting in 1998), with most jobs in both the exploration and development phases filled by commuters living in the petroleum industry enclave. By contrast, it is expected that the moderate number of new jobs created during the production phase starting in 1999 could be filled somewhat by permanent residents of a community.

A State wide peak population increase of about 580 persons could be associated with the projected employment increase. Of that number, a small proportion may live in a small town or village associated with development activity. The bulk of the new population (families of the enclave-living workers) could live in Anchorage, the Matanuska Valley, or on the Kenai Peninsula.

Impacts are potentially more significant in those areas of small present populations near which offshore-related activities may be located.

For the Beaufort Sea Planning Area, Barrow, Kaktovik, and Nuiquist are the towns that may be affected. Because of the small number of new jobs and population, anticipated impacts are expected to be low on a regional basis. Impacts at any one of the named villages could be low during an influx of population, depending on timing and duration.

CONCLUSION: Impacts could be low.

CUMULATIVE IMPACTS: Cumulative impacts of Federal oil and gas development in the Beaufort region plus the State governmental activities could substantially increase regional employment and populations. Because of the size of the planning area and the vast distances between coastal villages, local employment and population growth will more nearly follow estimated employment and population growth figures for the planning area rather than experience much growth on a cumulative basis.

CONCLUSION: Cumulative employment and subsequent population growth will be moderate both regionally and at a local level.

(b) Impact on coastal land uses

On the Beaufort Sea coast, the development scenario may place all onshore activities at locations previously developed--Camp Lonely, Oliktok Point, Deadhorse, and Bullen Point. As a result, overall patterns of land use on the Beaufort coast should not change. Changes in land use would occur, however, if roads were built to connect these support bases with Deadhorse and the haul road. Land use would also be altered if pipelines were constructed, especially if new pipelines were located onshore. Use of existing onshore pipelines and new offshore pipelines would have no effect on existing land uses.

Activity on the portion of the planning area west of Barrow could generate changes in land use. The shift would be from open areas used for subsistence purposes to developed lands used as a landfall for the offshore pipeline, and a road/pipeline corridor between Point Belcher and TAPS Pump Station No. 3. Production from this area is unlikely, however, unless it is combined with production from the Chukchi Sea and NPRA. Land use plans in place which modify or control land use in the North Slope Borough (NSB) include the Capital Improvements Program (CIP), the Comprehensive Land Use Plan Ordinance, and the Alaska Coastal Management Program.

CONCLUSION: Land-use effects will probably be low.

CUMUALATIVE IMPACTS: The proposed action and attendent pipeline service roads could extend petroleum infrastructure along the Arctic Coast to

Bullen Point southwest of Barrow. Viewed in conjunction with other petroleum developments, petroleum infrastucture could extend from Bullen Point on the Chukchi Sea to the Canning River east of Deadhorse. The proposed action may cause a rapid shift of portions of land from subsistence uses to that of industrial use.

CONCLUSION: The long term effects of lengthy linear development along the Arctic Coast and foothills of the Brooks Range may be high.

(c) Impact on commercial fisheries

The only continuous commercial fishing operation on Alaska's North Slope is operated by a single family (Helmericks) during the summer and fall months. Almost all of this fishing activity occurs in the east channels of the Colville River Delta. Arctic cisco is the most important cash product, followed by broad whitefish, least cisco, and humpback whitefish. The average annual catch has been about 65,000 pounds.

Given that a low ecological loss is expected for the species of concern, a low economic loss is expected for this commercial fishing operation (see previous section on fish resources).

CONCLUSION: The expected impact to the commercial fishery of this planning area is low.

CUMULATIVE IMPACTS: Cumulative impacts would result from those discussed previously (see section on fish resources). Development of all hydrocarbon resources in the planning area as well as other projects' proposals described in the preceding section (fish) would not significantly alter the impacts discussed under the proposal.

CONCLUSION: Cumulative impacts are assessed to be low.

(d) Impact on recreation and tourism

Most effects on recreation and tourism would be changes in economic values and noneconomic qualities. Changes in the number of users, property values, seasonal changeability, solitude, challenge, specialness, unity of the shore with onshore in winter, and visual qualities are examples. Effects are similar to those given in the Sale 87 FEIS (USDOI, MMS, 1984). The Beaufort Sea Planning Area is expected to produce 627 million bbls of oil and no gas from 2 platforms. The probability of hydrocarbons is 0.70.

Although there are cultural ceremonies and other interesting cultural activities at Barrow, positive effects of tourist interest in Prudhoe Bay and other industry activity partially offset negative effects.

CONCLUSION: Effects on recreation and tourism are very low.

CUMULATIVE IMPACTS: Impacts on recreation and tourism are caused by similar factors to those given in the Final Supplement to the FEIS, Proposed 5-Year OCS Oil and Gas Lease Sale Schedule for January 1982-1986 (USDOI, MMS, 1981) and is herein incorporated by reference. This discussion also considers causes of cumulative effects as given in Sale 87 (USDOI, MMS, 1984) which is herein incorporated by reference.

Conclusion: The cumulative effects are low.

(e) Impact on archaeological resources

Impacts on archaeological resources would result from disturbance to underwater landforms, shipwrecks, and historic sites. Onshore prehistoric and historic sites are likely to be affected by increases in industrial populations which in visiting the site could accidentally disturb it.

Impacts are similar to those given in the Sale 87 FEIS (USDOI, MMS, 1984). All land segments along the shore of the lease area would be affected to a small degree. Offshore ice gouging is believed to have destroyed all offshore archaeological resources except shipwrecks which have occurred in the last 100 years in deeper waters off Barrow. These wrecks, located in depths beyond ice gouging and of more recent occurrence than prehistoric sites, have a chance of survival. They would be affected moderately by the proposed lease schedule activity.

The Beaufort Sea Planning Area is expected to produce 627 million bbls of oil. The probability of finding commercial quantities of hydrocarbons is 0.70.

Unique archaeological or historical resources exist within the area and may be disturbed, resulting in minimal loss of data; or nonunique archaeological or historical resources may be contacted or disturbed, resulting in loss of data which may be equally obtainable from other sources.

CONCLUSION: Effects on archaeological resources are low.

CUMULATIVE IMPACTS: Cumulative effects on archaeological resources are caused by similar factors to those given in the Final Supplement to the FEIS, Proposed 5-Year OCS Oil and Gas Lease Sale Schedule for January 1982-1986 (USDOI, MMS, 1981).

CONCLUSION: Impacts are low.

(f) Impact on transportation systems

The principal effect of the proposed action may be the further extension of transportation systems infrastructure into western arctic regions (a pipeline to shore and existing support base, heliports, marine terminal, pipe yards, and roads). Heretofore, traffic within this region has been limited to air transport. Depending on the outcome of exploration and development efforts stemming from past Federal Beaufort Sea sales, hydrocarbons produced as a result of this proposal could flow into pipeline systems constructed in response to antecedent petroleum finds. This order of events would tend to reduce the effects of the proposal, which otherwise could result in extensive infrastructure construction. Viewed in this light, the proposal would have the effect of enlarging support facilities (docks, air fields, support bases, etc) and adding to the general logistics flow, rather than itself being the occasion for a large-scale construction effort.

CONCLUSION: The effects of the proposed action will probably be moderate.

CUMULATIVE IMPACTS: The cumulative effects of the proposed action will be muted in that it is only one of many proposed offshore and onshore sales for the arctic area. Heretofore, lease tracts have been sold in the NPRA as well as three previous Federal offshore Beaufort Sea sales. Infrastructure required to explore and develop resources which may be contained in the proposal could already be in place. This infrastructure may have sufficient capacity to meet the levels of activity associated with the proposal, particularly if there develops a definable trend in offshore discoveries.

CONCLUSION: Cumulative effects will probably be moderate.

(g) Impact on military uses

This is not a subject discussed in the Alaska OCS Region, as there are no restricted areas.

(h) Impact on subsistence-use patterns

This discussion summarizes the discussion of subsistence effects from the Beaufort Sea (Sale 87) FEIS (USDOI, MMS, 1984). The pipeline landfall may be in the vicinity of Bullen Point and travel overland to connect with TAPS. Air- and marine-support bases may both be in Prudhoe Bay. Refer to Section IV.B.11.a(5) in this document a general discussion of impacts on subsistence use patterns that may occur in the Alaska Region as a result of oil activities associated with the proposal.

Two oil spills of 1,000 barrels or greater are estimated. Moderate disturbance effects would be expected due to the moderately high resource estimate of the proposal. Short-term effects on bowhead whales are likely from oil spills, noise, and other disturbances, although long-term effects are unlikely. Effects on fish resources and caribou would not exceed moderate. However, moderate effects, although unlikely, could occur to subsistence use if impacts to both primary subsistence species (bowhead whale and caribou) at once or to several activities at once, or both, occurred.

Interference effects on subsistence activities of the residents of the North Slope Borough (NSB) would be very low because they would represent only incremental additions to existing industry activity.

The effect of increased competition for subsistence resources would be expected to be very low because of the continued use of the enclave at Prudhoe Bay.

CONCLUSION: Effects on subsistence resources are not expected to exceed moderate.

CUMULATIVE IMPACTS: Increased air, land, and marine traffic in the area and increased oilspills risk (4 spills) from platforms (3) and the pipeline (1) could increase the threat of disturbance and interference on the subsistence resources used by the residents of the planning area. Regionwide effects could occur due to reductions in a broad range of subsistence resources, changes in distributions, and limitations of access. Only a marginal increase in risk to subsistence resources would be expected from the proposal.

CONCLUSION: The cumulative effect of industry activities could result in moderate effects of subsistence in the planning area.

(i) Impact on sociocultural systems

Given the conditional resource estimates (627 mmbbls of oil) (2 platforms) and expected level of activity under this proposal, low sociocultural impacts are expected beyond the relatively high ones already experienced by the North Slope Inupiat since discovery and development of Prudhoe Bay.

This discussion summarizes the discussion of the effects on employment and demographic conditions from the Diapir Field (Sale 87) FEIS (USDOI, MMS, 1984). The pipeline landfall may be in the vicinity of Bullen Point and travel overland to connect with TAPS. Air and marine support bases may both be in Prudhoe Bay. Additional discussion is contained in Section IV.B.11.a(4) of this document on impacts to sociocultural systems.

To some degree, the North Slope may be affected by the influx of transient workers. Social tensions may increase due to cultural misunderstandings, the destruction of archaeological resources, insensitvity to the environment, or the importance of subsistence hunting. The enclave settlement pattern for workers should mitigate this problem to some degree. Finally, depending on future NSB policy and related court decisions, the influx of new workers should provide some funds for the Borough budget in the form of per capita State and Federal payments. At the same time, depending on workers activity, it may create a slightly larger number of non-Inupiat voters on the North Slope. These issues already exist; the proposal represents minor additions to them.

The NSB is urbanizing. Barrow leads in this process. Other North Slope villages are tied to Barrow's fate by the NSB through its centralized government, its service structure, and CIP programs. The profusion of telephones, television, and telecommunications are signs of this urbanization process. The increasing size of the villages, the growth of the system of roads along the rest of the infrastructure, increased NSB services, the growth of local businesses, and expanded linkages to Fairbanks, Anchorage, Juneau, and the wider United States are all part of this process. North Slope leaders and elders now sit down in other Inupiat circumpolar capitals to discuss common social, cultural, economic, and political issues. Their ability to act on these problems is now tied to the NSB's ability to finance local projects.

This process of urbanization is tied to continued oil development on the North Slope and to the use of oil revenues by the NSB to meet the costs of capital projects and governmental administration. This oil-fueled urbanization also brings problems. Changing lifestyles, especially among the young, an increase in drug and alcohol abuse, and an increase in domestic violence are all impacts to be borne. The growing infrastructure brings high operating costs which must be met; the system requires an increasing number of nonlocal experts to maintain it and to train local Inupiat in its workings. Development raises the level of state, national, and international scrutiny to which local decisions and solutions are subjected. It increases the need for cash to buy both traditional and non-traditional goods.

Interacting with this urbanization is the Inupiat sociocultural system. This system includes the subsistence economy of each village. It also includes the organization of task groups which carry out subsistence-related activities as well as the traditional forms of consumption, sharing, and bartering of subsistence goods. The sociocultural system includes, as well, the ways in which kinship, leadership, and the learning or role expectations and traditional wisdom are organized. Finally, it includes the complex of Inupiat cultural values which animate and make meaningful such institutions as the subsistence system, sharing networks, and the kinship system. These values include strong ties to native foods, to the North Slope environment and its wildlife, to the family, and to the virtues of sharing the proceeds of the hunt. The Inupiat sociocultural system has been affected by past North Slope oil developments, and it can be expected to feel the impacts of future ones. It has also played a stabilizing role in a dynamic, changing situation.

The public policy of the NSB is affected by the strong ambivalance within its constituency about the benefits and costs of oil development on the North Slope. The NSB leadership maintains a strong Inupiat voice for self determination, local control, and pride in the local benefits derived from North Slope oil revenues. The CZM and CIP programs, the Borough's support of the Kuparuk development, its oppositon to offshore leasing, and its support of whaling and subsistence hunting are all part of this policy. Not only are the Inupiat whaling captains largely entrusted with responsibility in maintaining the spirit of their people; they are entrusted with the same responsibilities leaders have had since traditional times.

The present proposal occurs offshore on federally administered submerged lands. Unless court decisions find otherwise, this fact will severely curtail the NSB's ability to regulate and tax the oil exploration and development that is likely to occur. To many NSB leaders, this situation appears to undercut such important and hard won institutions as the NSB Coastal Zone Management and CIP programs and, hence, Borough's ability to effectively represent its constituency.

Many studies have shown that effects on sociocultural systems are often evidenced in rising rates of mental illness, subsistence abuse, violence, accidental deaths, and other social problems. Several studies have addressed the issue of sociocultural change and its effects on the North

Slope. Two in particular (Kraus and Broffles, 1979, and Klausner and Foulhs, 1982) empirically tied growing social problems on the North Slope to the direct and indirect effects on onshore oil-related development. The growth of such problems is indicative of negative sociocultural impacts.

CONCLUSION: Impacts are expected to be low.

CUMULATIVE IMPACTS: The combined effects of Prudhoe Bay and Kaparuk oil production alone have produced high sociocultural impacts on the North Slope. Massive improvements to housing, education, and other facilities have transformed every North Slope village. Funds for these improvements have come from North Slope oil revenues. Localized changes related to Federal OCS exploration and State leasing programs could produce high impacts close to the exploration or development activity if the subsistence economy were seriously affected or if jobs in the industry were widely available to local residents. Both of these fundamental changes are not likely to occur under present circumstances.

CONCLUSION: The present level of cumulative impacts is expected to be moderate, with offshore oil exploration and development adding only incrementally to projected effects from onshore development.

b. Unavoidable Adverse Impacts

Section IV.B.11.b presents a discussion of the unavoidable adverse impacts of the proposal for all Alaskan planning areas.

c. Relationship Between Short-Term Uses of the Environment and the Maintenance and Enhancement of Long-Term Productivity

Section IV.B.11.c presents a discussion of the relationship between short-term uses of the environment and the maintenance and enhancement of long-term productivity attendant to the proposal for all Alaskan planning areas.

d. Irreversible and Irretrivable Commentment of Resources

Section IV.B.11.d presents a discussion of the irreversible and irretrievable commentment of resources attendant to the proposal for all Alaskan planning areas.

e. Environmental Impacts of a High Case Scenario

This section provides a discussion of the potential environmental impacts that occur in the unlikely event that all unleased, undiscovered, economically recoverable hydrocarbon resources in the Beaufort Sea Planning Area are leased and developed as a result of the proposal. The estimated "High Case" hydrocarbon resources for the Beaufort Sea Planning Area are 650 million bbls of oil. This estimate is 23 mmbbls higher than that for the proposal. However, infrastructure expected to be used to explore and develop these resources includes 22 exploration and delineation wells, 63 development wells, and 2 platforms. This is not significantly different from the proposal (22 exploration and delineation wells, 61 development wells, and 2 platforms). In addition, the estimated number of oil spills greater than 1,000 barrels remains at 2, the same as the base case proposal.

It is important to point out that the Beaufort area has existing offshore development. Resource estimates and infrastructure for the high case are almost the same as the cumulative case (627 mmbbls for the proposal and 650 mmbbls, high case). However, the high case assumes that the resource will be developed as a result of the proposed 5-year program lease sales, while the cumulative assumes that leasing and development will extend over the future 5-year program lease sales.

Production of the additional 23 million bbls of oil in the high case could be carried out in the same timeframe (35 years) as the proposal. According to the production scenario, it would require 2 more wells (perhaps on each producing platform on both or one). In the normal run of development activities, the additional amounts of drilling muds needed and cuttings produced would not add significantly (about 3 percent) to the amount from the proposal. No additional manpower, pipelines, other infrastructure, or pollutant waste are estimated to be added to those of the proposal. Therefore, impacts to all the resource categories analyzed may increase slightly; however, the significant differences in impacts cannot be differentiated from those described for the base case in Alternative I.

f. Alternative II - Subarea Deferrals

This alternative evaluates the deferral from leasing in the 5-year program of 13 additional subareas (14 subareas are deferred under Alternative I - The Proposed Action). One of these additional subareas is in the Beaufort Sea planning area:

Point Barrow

This deferral option would defer blocks immediately surrounding Point Barrow. The 59 blocks in the deferral area comprise an area of about 235,887 acres. The blocks are located approximately 3 to 21 miles offshore in water depths of 10 to greater than 150 meters.

The proposed deferral area includes the crest of the Barrow Arch and contains a thin (2,000-5,000 feet) Mesozoic sedimentary cover which overlies an Early Paleozoic metamorphic basement complex. Onshore exploration wells have encountered gas accumulations in Jurassic and lower cretaceous marine sandstones which subsequently were developed (at Barrow) by the U.S. Navy for local use. Similar shallow gas fields could be anticipated in other localities within this deferral zone, but large, oil-bearing structures are highly unlikely. The overall resource potential of the proposed deferral is low, relative to the entire Beaufort Sea Planning Area.

Air and water quality in the subarea can be considered pristine. Anadromous species found in the nearshore waters of the Beaufort Sea include arctic char, arctic cisco, least cisco, Bering cisco, boreal smelt, humpback whitefish, and broad whitefish. Pink and chum salmon have been reported from Simpson Lagoon and along the western Beaufort; however, their occurrence is thought to be occasional, with relatively low abundance.

Distribution of anadromous species along the coastline is highly variable in both numbers and species composition, although most species appear to use the narrow corridor of warm, brackish water previously described. Most anadromous fish appear to be concentrated along and immediately adjacent to the mainland shore (within 100 m) and along the edges and lee sides of barrier islands.

In contrast to information gathered for anadromous species, much less is known concerning marine fish. In general, marine species are widely distributed throughout the Beaufort Sea in relatively low densities, with schooling species such as arctic cod displaying a rather patchy distribution. Some marine species, arctic cod, and capelin sproadically enter the nearshore areas to feed on the abundant epibenthic fauna or to spawn. Others, like the fourhorn sculpin and flounder remain in coastal waters throughout the ice-free period, moving farther offshore with the development of the shorefast ice during the winter. The most important marine species in terms of abundance include the arctic cod, fourhorn sculpin, saffron cod, capelin, several species of snailfish, arctic flounder, and starry flounder.

Several million birds consisting of about 150 species including seabirds, waterfowl, shorebirds, passerines, and raptors occur on the North Slope adjacent to the Beaufort Sea. Nearly all of these species are found seasonally in the arctic from May through September. The most abundant marine and coastal species include red phalarope, oldsquaw, glaucous gull, and common eider.

In the Point Barrow area, high densities of birds occur offshore, apparently due to the increased productivity caused by nutrient intrusion from the Bering Sea.

Marine mammals occurring in this subarea include the ringed seal, bearded seal, spotted seal, polar bear, walrus, and beluga whale. Other species which are uncommon or rare in the area, but which occasionally occur in small numbers, include harbor porpoise, killer whale, narwhal, and hooded seal.

There are four endangered whale and two endangered bird species which may occur to a varying extent in or near the deferral area: the gray whale, bowhead whale, and rarely the humpback whale and fin whale, peregrine falcon, and (although probably absent), perhaps on an extremely rare basis, the Eskimo curlew. These six endangered species are those which, at least to a small extent, may be affected by a lease sale or associated activities in this subarea.

Hunters from each village pursue caribou, sheep, moose, squirrel, ptarmigan, and furbearers on land. In the ocean and on the ice, as much as 50 kilometers from shore, hunters pursue bowhead whales, seals, polar bear, and walrus. Along the coast, they hunt ducks and geese; and in the rivers, river deltas, and ocean, they take fresh-water and ocean fish. Bowhead whale, ugruk (bearded seal), caribou, ducks, geese, and fresh-water and ocean fish are primary resources and the focus of subsistence efforts in Barrow. All except caribou and fresh-water fish are hunted in this subarea.

Whaling is the single most valued activity in the North Slope subsistence economy today. Barrow residents have the longest tradition of whaling (done in this subarea), usually 15 to 40 whaling crews annually. In addition, anadromous fish species are taken by Barrow residents in the nearshore areas of this subarea.

This deferral could result in a reduction in the number of sites from which oil spills, discharges, and dredging and construction activities could occur. This block deferral would reduce oil spill risks to bird-feeding areas offshore of Point Barrow, and disturbances and habitat alterations onshore, and would reduce oil spill risks, noise and disturbance, and habitat alterations to marine mammals off Point Barrow. Reductions in the potential for oil spills and disturbance in the Point Barrow spring-migration corridor would reduce effects on bowhead whales. Effects to subsistence use patterns would be the same as for the proposal, except the deferral of blocks in the Barrow primary subsistence area would reduce expected local effects.

g. Impacts of Alternative III - Add a Sale in the Straits of Florida

Adding a sale in the Straits of Florida will not effect this planning area. However, under Alternative III, all sales proposed in Alternative I - the Proposed Action would be held. Therefore, the expected impacts of Alternative III are identical to Alternative I for this planning area.

h. Alternative IV - Biennial Leasing

This alternative increases the estimated amount of producible oil reserves from 627 MMbbls of oil in the proposal to 666 MMbbls. The number of platforms is expected to remain at 2; exploration wells remain at 22 but development and production wells increase from 61 to 65. The number of sales increases from two to three.

It could take 1 to 3 years more than the 35 years assumed for the life of the proposal (Alternative I) to produce the 39 million more barrels of oil estimated for this alternative. However, the addition of 4 wells to the 61 of the proposal could produce the assumed increase in the same timeframe.

The four extra wells could be split between the two producing platforms (the same as Alternative I), or they could be all on one platform. Whatever the division, the additional amounts of drilling muds needed and cuttings produced would not significantly (6 percent) add to the amount from the proposal.

No additional manpower, pipelines, or other infrastructure or pollutant are estimated to be added to those for the proposal. The number of oil spills (over 1,000 barrels) associated with this alternative remains the same as the proposal and therefore, impact levels on any resource category (fish, mammals, etc.) should not change.

Noise and disturbance effects from air and marine traffic could be extended for 1 to 3 years because of the alternative. However, impact levels on marine mammals (ringed seals, beluga whales) should not rise because there would be no increase in the daily traffic level. Daily traffic levels would probably remain the same as the proposal during the drilling effort for the four additional wells.

CONCLUSION: Impacts to all resource categories analyzed may increase slightly; however, significant difference on impacts cannot be differentiated from those of Alternative I.

i. Alternative V - Acceleration Provision

This alternative (Acceleration Provision) would accelerate the sale schedule outlined for Alternative I by 1 year. However, the accelerated schedule would not shorten the current presale process.

Under Alternative V, the resource estimates (627 MMbbls of oil) and all development assumptions are identical to those for Alternative I. Because the estimates and assumptions are identical, the impacts of Alternative V on all resources categories would be the same as Alternative I, except that they could be accelerated by 1 year.

j. Impacts of Alternative VI - Defer Leasing in Six Planning Areas: North Atlantic, Washington and Oregon, Northern California, Central California, Southern California, and North Aleutian Basin

Selection of Alternative VI would defer leasing in six planning areas. However, under this alternative, the same level of leasing would occur in this planning area as would occur under Alternative I. Therefore, the impacts of this alternative in the Beaufort Sea would be the same as under Alternative I.

k. Impacts of Alternative VII - No Action

Under this alternative, the Secretary of the Interior would propose not to schedule any oil and gas lease sales for this proposed 5-year program. All potential impacts from OCS oil and gas activities to the physical, biological, and socioeconomic environment resulting from implementation of this 5-year program would be eliminated.

Oil and gas are currently the Nation's primary energy source. Even with a vigorous conservation program, the U.S. demand for energy will continue to grow. With the adoption of Alternative VII, the oil and gas that would have been available as a result of this proposed program would no longer contribute to the national domestic production during the life of the program.

With the removal of the potential oil and gas from the national energy reserves, it would necessitate the increased production of energy from other conventional and nonconventional energy sources and/or increases in import levels from foreign sources. See Section II.A.7 for a summary of potential impacts of alternative energy sources, and Appendix C for a general discussion of alternative energy sources.

22. Straits of Florida

a. Alternative III - Add a Sale in the Stratis of Florida

The Proposed Action does not include a sale in the Straits of Florida. This alternative evaluates the potential impacts of adding a lease sale in the Straits of Florida to the sale schedule proposed in Alternative I.

(1) Interrelationship of Proposal with Other Projects

(a) Coastal zone management

The coastal area which could be affected by exploration and development of the nondeferred portion of the Straits of Florida Planning Area is contained within the State of Florida. Specifically, this area would include Brevard County on the Atlantic side of the peninsula, extending southward to include the counties of Indian River, St. Lucie, Martin, Palm Beach, Broward, and Dade and the Keys. Conceivably, Monroe and Collier Counties on the Gulf coast could also be included. Activities relating to OCS development are addressed by the State through the policies contained in the Florida Coastal Management Program (FCMP, 1981). In the FCMP the State has pledged their commitment to "develop a workable siting process for nearshore and shoreline (OCS) facilites." Florida has established policies which are oriented toward facilitating the review process for both OCS exploration plans and any consequential onshore facilities. Onshore energy facility siting in the State will be guided by the provisions of the 1979 Industrial Siting Act (among other laws), which essentially promotes industrial development in appropriate areas. The configuration of this alternative contains no provisions that would prevent it from being conducted in a manner which is compatible with FCMP.

(b) Ocean dumping

Ocean dumpsite locations in the nondeferred portion of the Straits of Florida Planning Area are shown in Figure III.A.4.a.6-1. Dredged materials are the only materials presently being dumped in this area. The two dredged materials dumpsites (Largo Sound and Key West) are within or close to State territiorial waters which extend 3 nmi out from shore (40 CFR 228.12, July 1, 1984). Being this close to shore, these dumpsites are highly unlikely to have any interaction, in terms of area use conflict or synergistic action of wastes, with the proposed OCS oil and gas activities by this alternative. Should there develop a potential for area use conflict (e.g., OCS gas pipeline routing being proximate to a dumping site), this could be subsequently resolved through coordination and planning.

Within the nondeferred portion of the planning area, there is one major site formerly used for dumping of undetonated explosives (e.g., bombs and depth charges) (Defense Mapping Agency Navigational Chart No. 410, 1981). Disturbance of these potentially hazardous materials by OCS oil and gas activities (placement of 1 gas pipeline, installation of 1 production platform, and drilling of 22 exploration, delineation and production wells) resulting from the 1 sale is highly unlikely. MMS has authority under operating Order No. 2 to require a lessee to perform predrilling hazards surveys. This would include surveys to detect explosives where such surveys may be warranted. Such precautions would minimize the probability that undetonated explosives would endanger drilling activities.

CONCLUSION: Impacts from oil and gas operations on ocean dumping are anticipated to be low.

(2) Projects Considered in Cumulative Impact Assessment

(a) Oil and gas activities (State and Federal)

There are currently no active leases (either State or Federal) in the nondeferred portion of the Straits of Florida Planning Area. Therefore, the cumulative impact assessment will not consider oil and gas activities other than the proposed and alternative scenarios including the transportation of domestic and imported crude oil and refined products.

(b) Military operations

More than 60 percent of the nondeferred portion of the Florida Straits Planning Area is used by the Air Force, Navy, and NASA for air, surface, and subsurface operations. Warning Areas 174 and 465 are used by the Navy for carrier maneuvers, carrier pilot training, gunnery and bombing practice, and submarine maneuvers (Figure III.A.4.a.6-1). The Navy has a surface and a subsurface submarine operating area out of Port Everglades, Florida. Naval activities include carrier maneuvers, carrier pilot training, gunnery and bombing practice, and submarine maneuvers.

The John F. Kennedy Space Center (KSC) at Cape Canaveral in Florida is a NASA installation from which numerous space satellites are launched each year. It is the primary location from which the space shuttle is launched. Shuttle launches are currently taking place approximately 1 every 3 months, but are expected to increase in frequency to 18 per year by 1988. The military uses the Eastern Space and Missile Center (ESMC), also located at Cape Canaveral, to test various types of missiles. The area offshore is also used for submarine launch activities. The flight clearance zone for the KSC and the ESMC is the extent of the area which NASA and DOD require to be kept free of surface activity during missile and shuttle launches (Figure III.A.4.a.6-1).

The controlling authorities are responsible for directing oceanic and air maneuvers and for coordinating them with other endeavors, such as OCS oil and gas activities. Overall responsibility for DOD's Offshore Military Activities Program is vested in the Assistant Secretary of Defense (Manpower, Reserve Affairs, and Logistics). Under the policy specified in 32 CFR 252, DOD will endeavor to accommodate, to the maximum extent feasible, joint use of any areas determined by the DOI to have mineral potential. In addition, conflicts which may arise because of the differing requirements for mineral exploration and development and defense-related activities will be discussed, and mutually agreeable solutions reached as early as possible in the planning process, according to a Memorandum of Agreement between DOI and DOD, dated July 20, 1983.

(3) Physical Environment

(a) Impact on water quality

The sources (normal and accidental) of offshore water quality degradation for the Atlantic Region in general are introduced and discussed in Section IV.B.1.a(3)(a)(i)--(Introduction to Impacts for the Atlantic Region).

The most serious impact to offshore water quality within the nondeferred portion of the Straits of Florida Planning Area would likely result from a large (> 1,000 bbl), acute oil spill which may occur as a result of a tanker or platform accident, a well blowout, or a major pipeline break. For this alternative, it is assumed that 1 oil spill of greater than 1,000 bbl would occur within the nondeferred portion of the planning area (Table IV.A.1-4).

A moderate to high level of water quality impact may be expected if such a large oil spill occurred close to shore or was transported there by winds and currents, such that the oil was then tied-up within a low energy regime having poor circulation as in an embayment. This may result in elevated levels of oil and weathered products being retained and reintroduced within the shallow water column for extensive periods of time. Oil, if spilled within the nondeferred portion of the Straits of Florida Planning Area, would likely result in a surface layer (slick) which would be transported in a northerly direction along with the Florida Current/Gulf Stream generally away from the coast. However, water and spilled oil may also be transported toward shore from the Florida Current as a result of the spin-off eddies described by Lee (1975).

Local water currents (especially the dominant Loop and Florida Currents) and depths would greatly influence the fate of the estimated 326,000 bbl of drilling muds and 101,800 bbl of drill cuttings which would be discharged by this alternative. Generally, however, because of the relatively small volume of the drilling discharges compared to the large volume of receiving water, the predominantly rapid settling and dispersion of the discharged materials to background levels, and because discharges would be spaced over a large area and long period of time (approximately 9 years), impacts on ambient water quality are expected to be low. Also, only those muds designated by the EPA to be environmentally acceptable, as determined by bioassay test results, can be discharged on the OCS. The anticipated low impact on water quality from drilling muds and cuttings by this alternative is in agreement with the general conclusion of minimal environmental risk determined by the National Research Council Marine Board study (NRC-MB, 1983).

Discharged formation waters (16.8 million bbl) which would be released over an approximate 25-year period would be diluted rapidly and ultimately lost in the large volume of receiving water. Depending on hydrographic conditions, background levels of trace metals would be reached within a few hundred meters. The hydrocarbon content of discharged formation waters would be within the EPA's prescribed effluent limits [the concentration of oil should not exceed an average 30-day concentration of 40 mg/l (40 CFR 435)].

Minimal impacts are expected from the discharge of domestic wastes, sanitary wastes, and discharge of low levels of oil from such sources as deck drainage. These discharges are regulated by the EPA through the National Pollutant Discharge Elimination System (NPDES) permit requirements and are quickly diluted to ambient levels in the receiving waters.

An increase in levels of suspended sediments and turbidity as a result of gas pipeline burial or breakage would be a local and temporary phenomenon. Operational discharges of oil from ships would not substantially affect water quality, in that only a limited increase in shipping by oil tanker is associated with this alternative. Also, recent stricter regulations now address discharges from vessels (e.g., discharges are permitted only 50 mi beyond land).

Low impacts to onshore water quality are anticipated as a result of increased nonpoint and point sources of pollution associated with the construction and operation of onshore facilities supporting the non-deferred portion of the Straits of Florida Planning Area OCS activities.

Runoff from construction and operation of onshore support facilities constitutes a nonpoint pollution source. The construction of one new gas pipeline (and associated landfall) and 1 new gas processing plant will likely cause increases in surface runoff to nearby streams and rivers. This runoff would likely contain increased levels of suspended solids and heavy metals. Nonpoint source impacts may be minimized by controlling erosional effects generated within construction site boundaries, with several of the adverse impacts being localized and prevented from having offsite impacts on water bodies in the vicinity of these activities. Increases beyond normal background levels would be temporary and of a limited duration.

Increased effluent discharges will occur through point sources related to oil and gas operational support activities, primarily the one new gas processing facility. Wastewater discharge from a plant would include chemicals such as chromate, zinc, chlorine, phosphate, sulfide, and sludge conditioners, as well as oil and grease. Four sources of wastewater from operations of the new support base would include sewage, bilge water, ballast water, and cooling water (NERBC, 1976). Point source discharges, however, will be subject to Federal and State water pollution control regulations and permitting; thus, potential adverse impacts can be mitigated.

CONCLUSION: An overall, moderate impact on water quality is anticipated by this alternative. The discharge of routine offshore effluents (e.g., muds and cuttings) and the effects of onshore point and nonpoint sources would result in generally local and relatively minor water quality perturbations. However, a large accidental oil spill offshore may cause a substantial and long-lasting alteration of ambient water quality.

CUMULATIVE IMPACTS: When all oil spill sources are considered, the total assumed number of large (> 1,000 bbl) oil spills within the nondeferred portion of the Straits of Florida Planning Area over a 30-year period is 1--this being the same number as assumed for the Straits of Florida Alternative alone (Table IV.A.4.A.2). A moderate to high level of water quality impact may be expected if such a large spill occurred close to shore or was transported to shore by spin-off eddies.

Under a cumulative case consideration, the total OCS oil and gas exploration and production activities within the planning area would result in a substantial increase in the volume of routine discharges (drilling muds and cuttings, formation waters, domestic and sanitary wastes, and deck drainage). Compared to the nondeferred portion of the Straits of Florida Alternative proposed action alone, this increase may be as much as 2-fold for some of these discharges. However, the total volume of these materials would still be small compared to the large volume of the receiving water. These materials would be rapidly dispersed/diluted within a geographically large area and spaced over a long (possibly 30-year) period such that the impacts to water quality, from these discharges, would be low and temporary in nature.

Two active, coastal dredged-materials dumpsites are located within the nondeferred portion of the Straits of Florida Planning Area (ocean dumping is discussed in Section IV.B.22.(1)(6). The impact on water quality from these EPA approved dumpsites is uncertain since these sites have "interim" status meaning that environmental studies for determining impact have not been completed.

Sources which may cause degradation of onshore and nearshore water quality in the nondeferred portion of the Straits of Florida Planning Area, in addition to those associated with the proposed action, can be broadly categorized as intentional point (or pipeline) discharges, nonpoint discharges, and accidental discharges.

The major intentional point source discharges of waste materials into inshore and coastal areas come from sewage treatment facilities, industrial facilities, and electric-generating facilities. These pipeline discharges are regulated by the EPA through the NPDES. The accidental discharge of oil and hazardous materials into water bodies may occur during loading and unloading operations in ports and harbors, pipeline leakage, equipment failures, and spills from land vehicles and storage facilities onshore.

Nonpoint source pollution occurs when runoff enters a body of water carrying with it pollutants from the land, such as petroleum hydrocarbons and lead for parking lots, pesticides and nutrients from residential lawns or agricultural fields, pathogens from faulty septic systems, or toxic materials from industrial areas. Canal construction within southern Florida has had a major effect on water quality in the coastal estuaries and bays. During spring runoff and flood conditions in the State's interior, these artificial waterways serve to channel freshwater rapidly into the coastal waters of the region, along with accumulations of pesticides, oil and grease coliform bacteria, and other substances. The impacts of polluted canal discharges are particularly severe in the estuarine waters of the Intracoastal Waterway and the smaller estuarine areas between Indian River and Biscayne Bay because of poor circulation and exchange with the Atlantic Ocean in these areas. The general water quality in the Northern Biscayne Bay area is poor, largely due to urban development and the quality of water flowing into the Bay from canals and rivers.

CONCLUSION: An overall, moderate impact on water quality is anticipated when the cumulative effects of all actions are considered. The impact on offshore water quality is anticipated to be moderate, thus, essentially unchanged from that projected for the Straits of Florida Alternative alone; the impact on onshore water quality increases to a moderate level.

(b) Impact on air quality

The regulatory framework for air pollution control and the anticipated impacts from potential OCS activities are described in Section IV.B.1.a(3)(b). The information contained therein is applicable to this alternative; the same levels of impact are anticipated. The development scenario for this action assumes that natural gas would be transported via pipeline to an onshore gas processing and treatment facility in a presently undetermined location. Such a facility would be individually designed for the particular gas stream that it processes. The type and magnitude of air emissions are determined by the volume of gas processed, the composition of the gas stream, plant design, and choice of pollution control equipment. If the gas stream contains a high concentration of hydrogen sulfide, H2S (i.e. "sour gas"), the "sweetening" process will result in large amounts of SO2 emissions. SO2 emissions resulting from the processing of "sweet gas" (low H2S content) are normally not a problem. Other potential pollutants from gas plants include nitrogen oxides, particulates, carbon monoxide, and other hydrocarbon gases. A typical gas plant's emissions may include

	(tons/year)
NOx	1,590
SOx	221
CO	56
Pariculates	36
Hydrocarbons	24

CONCLUSION: A low level of impact on onshore air quality is possible from proposed OCS activities in the planning area.

CUMULATIVE IMPACTS: Industrial vessel traffic supplying the major coastal ports can affect onshore air quality. Industrial and urban development centers have a negative effect on onshore air quality. These existing activities will have a cumulative adverse impact on onshore air quality.

CONCLUSION: Cumulative activities should not exceed a moderate level of impact on onshore air quality.

(4) Biological Environment

(a) Impact on plankton

Concentrations of plankton are disturbed in patches of various sizes which are scattered by prevailing winds and currents. Drilling discharges are not expected to appreciably affect plankton populations. In the event of an oil spill, the oil would also be moved by the wind and water and would probably remain in contact with some of the surface plankton for an extended period of time. This would probably cause large mortalities or seriously inhibit the biological functions of the associated phytoplankton or zooplankton. Therefore, high local impacts would be expected but, because of the high reproductive rate of the phytoplankton, very low regional impacts are anticipated. The zooplankton would experience slightly higher regional impacts, primarily as a result of the loss of the meroplankton component. However, in relation to the size of the planning area, the area affected by an oil spill is relatively small. Therefore, the regional impact is expected to be low.

CONCLUSION: The impact level as a result of this alternative is anticipated to be low.

CUMULATIVE IMPACTS: There are no leases presently in effect in the planning area. Sections of the planning area are used by military operations including gunnery and bombing practice. The quantity of ordinance exploded in these areas is not available; however, it is expected that severe local impacts to the meroplanktonic component of the plankton, especially, could occur. The major cause for concern on a regional level would be the transport of petroleum products through the area and the associated risk of oil spills. However, because of the relatively high resilence of the plankton community, overall impact levels are expected to be low.

CONCLUSION: Low impact levels are expected, under the cumulative case.

(b) Impact on benthos

(i) Intertidal

The intertidal areas to be considered vary from high energy sandy beaches to low energy marshes, tidal flats, and mangroves. OCS activities that could have an impact on the intertidal areas are the laying of the one gas pipeline, the development of a support base, and a gas processing plant. The discharges produced from the 1 platform and 22 wells built offshore are not expected to reach or affect the intertidal benthos.

Placing of the gas pipeline in the high energy, seasonally shifting sandy area would have a short-term local impact. One oil spill of 1,000 bbl or greater is assumed. If oil were to reach shore, impacts would depend on the amount and the weathering of the oil. Mechanical cleanup would cause a high short-term impact resembling the erosional effects found on a high energy beach while reducing recovery time from damage due to the oil. The low energy environments, except for mangroves, would suffer a short-term high local impact due to the placing of a pipeline. The mangroves would experience a long-term recovery if they were to reestablish. If oil were to reach shore in quantity, the benthos in low energy areas could experience physical hazards (smothering) or physiological effects (immobility) rendering the benthos as easy prey. Chronic input from hydrocarbons in the sediment could effect local benthos population through inhibiting repopulation and preventing recovery for years.

Under this alternative, the probability of a spill (greater than 1,000 bbl) occurring is 5 percent (Table IV.A.4.a.4). If the assumed spill occurred it would most probably occur at some distance from shore and be transported away from shore, during which time weathering would occur.

(ii) Subtidal

Benthic habitats vary from exclusively sandy patches and grass beds to widely scattered natural reefs of exposed limestone, shell, sand and gravel which can support hard corals and gorgonians, to moderate reefs which support large benthic (live bottom) and pelagic communities. The large beds of sea turtle and manatee grass are located in shallow waters and would be most susceptible to oil washing inshore. The reefs and live bottom areas would experience local impacts due to anchoring, drilling, trenching a pipeline, and platform and wellhead emplacement. At a site of discharge, benthic communities could experience direct burial by cuttings or inhibition of filter feeding systems. Under the proposed alternative, 1 platform and 22 wells are expected over the next 10 to 20 years. Local impacts to live bottoms due to mechanical perturbation and burial will be high and long-term. Benthos in sandy communities will experience locally high short-term impacts. If drilling were to occur in the shallow water grass beds, impacts could be very local and high and moderate-term since this is a low-energy environment. Regionally, impacts would be low.

One subtidal oil spill of 1,000 bbls or greater is assumed to occur. Impacts from an oil spill to benthos will vary with water depth, type oil, and local mixing conditions. [See Section IV.B.1.(4)(b)]. Benthos in shallow waters (60m) could be subject to oiling from nearshore and offshore spills. Oil spilled and remaining in deep waters could be subject to weathering and dissipation, limiting contact and impact on the deep water benthos. Regionally, impacts would be low.

CONCLUSION: Under the proposed alternative, subtidal benthos could experience a low impact.

CUMULATIVE IMPACTS: No leases from previous sales exist; however, tankers transporting oil from the Gulf of Mexico travel on the border of and through the Straits of Florida to the Gulf Stream. A portion of the Straits is used by the military for air, surface, and subsurface operations including gunnery and bombing practice. Use by the Navy occurs primarily in the winter. Overall impacts on a regional basis are not expected to appreciably affect the benthic populations.

CONCLUSION: Intertidal and subtidal benthos would be expected to experience low impacts.

(c) Impact on fish resources

The most severe impact to fish resources in the nondeferred portion of the Straits of Florida Planning Area would result from the 1 oil spill of 1,000 bbl or greater which is assumed would occur under this alternative. Although local impacts to fish resources would occur as a result of structure siting or the discharge of drilling muds and cuttings, these impacts are not considered to affect the fish populations to an appreciable degree or over a long term. However, because of the likelihood that the Gulf Stream/Florida Current frontal events could quickly transport an oil spill over a large area or closer to shore, an oil spill represents a potentially severe risk to fish resources in the area. Generally, the impacts on the fish species from an oil spill would parallel those of the other Atlantic planning areas [see Sections IV.B.1.a(4)(c), IV.B.2.a(4)(c), and IV.B.3.a(4)(c)]. But the species most susceptible to acute oil spill impacts would be those associated with reefal or live bottom habitats. This is primarily a result of the decreased habitat range of those species that require specific habitat structures.

An oil spill which affects the lower trophic biosphere of these communities has the potential to disrupt the fish resources for a considerable length of time by disrupting niche space relationships and modifying ecological interactions.

Under this alternative, it is assumed that 1 oil spill of 1,000 bbl or greater will occur, although the probability of a spill, based on the historic spill rates, is very low. Based on this assumption, a high impact level would be expected.

CONCLUSION: A high impact level is anticipated under this alternative.

CUMULATIVE IMPACTS: Cumulative impacts to the fish resources of the Straits of Florida are derived from a number of sources including commercial fishing, transportation of domestic and foreign oil through the area, and potential oil spills in the Eastern Gulf of Mexico Planning Area. At present, commercial fishing represents a very low impact on fishery resources; however, the cumulative impacts from oil spills resulting from transportation and potential eastern Gulf of Mexico lease sales is very high.

CONCLUSION: The cumulative impact level is very high.

(d) Impact on marine mammals

Under the proposed alternative, OCS activities would have a limited probability of causing an impact because of the size of the nondeferred portion of the planning area, and depth of the water. The Straits of Florida do not appear to be a limited critical area for any nonendangered marine mammals. Any offshore disturbances resulting from drilling discharges or oil spills could potentially be avoided by nearby mammals. Displacement would be temporary without lethal effects. Contact with oil could cause some irritation or fouling of baleen, but in general, dolphins and cetaceans do not stay in contact with or ingest oil and do not experience severe reactions.

CONCLUSIONS: The proposed action should have only a low impact on marine mammals.

CUMULATIVE IMPACTS: The Straits of Florida is used as a passageway from the Gulf to the Atlantic for OCS and non-OCS-related vessel traffic, increasing the possibilities of marine mammals contacting vessels. Recreational boats and commercial fishing vessels provide additional collision possibilities. Military maneuvers, both in the air and the water, occur in the area adding to potential disturbances by startling marine mammals from the area. These impacts, in addition to this alternative, could increase potential impacts to marine mammals.

CONCLUSION: Under cumulative impacts, marine mammals could experience a low impact.

(e) Impact on coastal and marine birds

Marine birds are more conspicuously affected by petroleum than other marine groups. However, habits differ, and species or groups of species are affected to varying degrees. Variables include the amount of time spent on the water, prey species, feeding strategies, proximity of nesting sites, and the tendency to roost on the water.

Among the marine birds, diving species and species that spend most of the time on the water's surface (e.g., loons, grebes, and cormorants) have a much greater risk of contacting oil. Populations of these birds are very slow to replace lost numbers because of their low reproduction rates. Therefore, oil spill mortalities could result in both short- and long-term adverse effects.

Shorebirds and wading birds would be vulnerable to oil spills that entered nearshore and coastal waters and beaches and intertidal areas. Service vessel helicopter traffic and onshore support facilities to be built could affect wading birds or shorebirds if significant filling of wetland or coastal habitats are required to accommodate OCS service vessel or support facilities.

Under the proposed alternative, the one oil spill and onshore development could have an effect on seabirds. But the spill could occur during a noncritical time (e.g., absence of birds due to migration) and, therefore, have a limited effect.

CONCLUSION: The marine and coastal species of seabirds could experience a low impact.

CUMULATIVE IMPACTS: No leases from previous sales exist or additions planned to the proposed number of support bases, pipelines, or gas processing plants for the proposed alternative. Tankers transporting oil from the Gulf of Mexico will pass through the Straits, increasing the probability of an occurrence of an oil spill but not the estimated number of spills. Tanker traffic in the South Atlantic and Mid-Atlantic could cause a spill impacting on migrating seabirds of the Straits of Florida.

Impacts that are not related to OCS activities but could contribute to a cumulative impact to avian resources include the loss of nearshore and onshore feeding and breeding habitats due to private and recreational development posing a serious long-term threat to wading birds and shorebirds in particular. Those species which migrate as far as Central and South America could be exposed to toxic substances which are widely used, like DDT, that will inhibit reproduction. Chemical wastes from designated ocean dumpsites could have an adverse effect, especially on marine birds, by degrading the ocean environment. Increased air use and nautical maneuvers by the Navy along with their bombing and target practices could stress avian populations. Impact levels will probably remain low since onshore development is a one-time operation, the number of oil spills remains at one and non-OCS activities are not known to have lethal effects.

CONCLUSION: The marine and coastal birds could experience a low impact.

(f) Impact on endangered and threatened species

(i) Seabirds

The bald eagle is a shore bird which would be susceptible to oil spills mainly by eating oiled prey washed ashore. Wading birds such as the whooping crane would also be most susceptible to oil that reached shore and infiltrated into coastal waterways. Further ranging birds such as peregrines and brown pelicans have a higher potential for contacting spilled oil. Peregrines are known to range as far as 300 miles offshore, so would be susceptible to contacting any spill. Brown pelicans remain closer to shore, but due to their plunge diving for fish and resting on open water, it is likely that these birds could be fouled by a spill in their vicinity.

Because only one oil spill is assumed to occur, the chances of endangered birds contacting oil or oiled prey is limited.

CONCLUSION: The proposed alternative could have a low impact on endangered and threatened species.

CUMULATIVE IMPACTS: Because oil from the nondeferred portion of the Straits of Florida Planning Area is expected to be transported to refineries in the Mid-Atlantic region, OCS development in the nondeferred portion of the Straits of Florida could have a cumulative effect on migrating endangered birds and coastal species present in the Mid-Atlantic area. A tanker carrying crude oil from the nondeferred portion of the Straits of Florida could spill oil in the Chesapeake and Delaware Bays or along the Delaware, Maryland, and Virginia coasts. This could threaten bald eagles in the Chesapeake Bay and migrating peregrine falcons. Because the bald eagle and peregrine falcon migrate, these birds could come in contact with spills in the Mid-and South Atlantic regions. The cumulative effect of this could result in a small number of birds becoming fouled with oil. It is unlikely that this would have a serious adverse impact on each population, but may result in the mortality of some individual birds.

Impacts that are not related to OCS activities but could contribute to a cumulative impact to all coastal species would include the loss of onshore breeding, migratory stop-over and over-wintering habitats from private and recreational development of coastal areas.

CONCLUSION: Cumulative activities could have a moderate impact on endangered marine birds and coastal species.

(ii) Endangered turtles

Sea turtles in the region face a low risk of contacting a spill because only 1 spill greater than 1,000 barrels is assumed to occur over the production life of the field.

It is generally accepted that offshore platforms act as artificial reefs by causing a large increase in biomass in their immediate vicinity. Such an increase will probably attract feeding turtles. One production platform is expected to be used to develop the field under the proposed action. [See discussion in Section IV.B.1.a(4)(f)(ii)].

The leatherback could be adversely affected by sale-related activities and oil spills from the lease area in early spring and late fall when the majority of turtles are believed to migrate. The Atlantic ridley prefers shallow coastal waters and is present there from spring through fall. The fact that this species is a bottom feeder reduces the opportunities for contacting spilled oil or for ship collisions.

Because the loggerhead is the most abundant sea turtle in the region, it will suffer the most exposure to OCS activities. If one oil spill under the proposed alternative occured in the region, some loggerhead turtles could come in contact with it. This could adversely affect many individuals but should not affect the total population because of their relatively large numbers and widespread distribution.

An oil spill from OCS production and development off the coast of Florida would pose the greatest risk to loggerhead nesting beaches. Should an oil spill occur in nearshore docks or from a nearshore tanker route, it would pose a moderate threat to loggerhead nesting beaches along the Florida coast and a minor threat to all other nesting beaches. A pipeline landfall could disrupt nesting activities if construction occurs during the nesting season (April through August, with a peak in June). However, it may be possible to time construction so as to avoid the nesting season or to relocate any nests discovered in the right-of-way.

The hawksbill and the green sea turtle would be vulnerable to oil spill related impacts during the spring, summer, and fall seasons.

CONCLUSION: The proposed action could have a low level of impact on endangered or threatened sea turtles inhabiting the region.

CUMULATIVE IMPACTS: Additional impacts to sea turtles could occur due to oil being transported from the Gulf of Mexico. Additional spills are not anticipated, but the probability of one occurring does increase. The increase in vessel traffic from the transporting of oil raises potential contact between turtles and vessels. Platforms, sunken vessels, and reefs attract recreational fishermen and feeding turtles. Turtles could be endangered by the close proximity of fishing vessels and fishing gear. Though individuals may suffer, populations of the turtles are not expected to be noticeably effected.

A non-OCS activity that could noticeably effect populations especially that of the hawksbill is trawl fishing in the Gulf and Straits of Florida. Trawling though would be difficult where turtles are most likely to populate.

CONCLUSION: Cumulative impacts could cause a low impact on endangered turtles.

(iii) Marine mammals

Whales, dolphins, and manatees could be vulnerable to several adverse effects from oil spills, drilling noise, and location of structures. Under the proposed alternative, only 1 spill greater than 1,000 bbls is assumed to occur; therefore, most marine mammals have a low risk of contacting oil. Offshore oil exploration and production will cause an increase in ship traffic. The additional traffic could increase the probabilities of vessel and mammal collisions. However, the actual number of collisions would probably have an insignificant effect on most populations because collisions between ships and large whales at sea are apparently infrequent occurrences based on limited field observations. Findings suggest that OCS drilling sounds will not have a serious disruptive effect on marine mammals and usually are not noticed if they are several hundred yards away.

Sightings of whales in the Straits of Florida consist mainly of sperm, humpback, minke, and fin. Minke and endangered fin and humpback whales are coastal and coastal shelf species. The endangered sperm is most frequently sighted at the shelf edge and in deeper waters. Right whales are not known to utilize the area.

Production and development activities associated with the proposed action could pose a threat to the whales because of the different nature of the potential impacts (e.g., oil spills, baleen fouling, or oil ingestion). The low number of spills combined with the fact that the whales are in the region for a limited period of time each year indicate that the whales should have a low chance of contacting the spill.

Manatees inhabit shallow waters along the coast and in waterways. If the assumed one spill were to occur nearshore, the chances that manatees could contact oil would increase significantly. Food sources could become contaminated causing manatees to ingest oil or search for supplemental food sources. The likelihood of impacts affecting manatees is low, however, because the likelihood of an oil spill occurring and coming inshore at a time manatees are present, and at the same time, contacting a large portion of manatee habitats and food resources is low.

There could be an increased potential of collision with service vessels as manatees are known to migrate through the coastal areas. This would be limited, however, to the area where the facilities are located.

The building of onshore facilities could affect manatee habitats depending upon where the facilities are located. Dredging and filling of wetlands, pollution discharges, and water supply requirements would be the primary impact-producing factors. However, any processing facility would have to obtain Federal and State permits prior to construction that would prohibit serious mitigation of any adverse impacts to manatee habitat.

CONCLUSION: The proposed action may have a low impact on endangered and threatened marine mammals.

CUMULATIVE IMPACTS: Cumulative impacts to endangered whales from OCS activities in adjacent regions are uncertain as the fin, sei, sperm, humpback and right whales are known to occur to some degree in all three OCS lease areas bordering the Atlantic coast. The low number of assumed spills (one spill in each of the North, Mid-, and South Atlantic Planning Areas) combined with other OCS activities will probably result in some adverse impacts including the possible loss of a few whales which could inhibit the return of each species to a nonendangered status. [See Section IV.B.1.a(4)(f)(iii) for further discussion on cumulative impacts.]

CONCLUSION: Cumulative impacts could have a high impact on endangered marine mammals.

(g) Impacts on wetlands and estuaries

The potential risk to wetlands and estuaries would be a result solely of the assumed 1 oil spill of 1,000 bbl or greater. The mangrove systems found in this area would be particularly vulnerable because of the free water flow into the interior of these areas and the generally exposed (to open water) nature of their habitat.

CONCLUSION: Based on the one assumed oil spill and potential for contacting estuaries and wetlands, a low impact level is expected.

CUMULATIVE IMPACTS: The major potential risks to estuaries and wetlands are a result of tanker transportation of petroleum products and human encroachment on these systems.

CONCLUSION: A moderate level of impact is expected from the cumulative sources, and this alternative is not expected to modify this level.

(h) Impacts on areas of special concern

Areas of particular concern would be the live-bottom and reefal communities and the Oculina banks which have been designated as Habitat Areas of Particular Concern by the South Atlantic Fishery Management Council. All of the above areas would be susceptible to mechanical damage from oil and gas structures and drilling discharges. Generally, the Oculina habitat would be less susceptible to damage from the 1 assumed oil spill of 1,000 bbl or greater because of the relatively deep water of the area. However, the live-bottom areas and the tropical reef ecosystems would be very likely to sustain extensive damage if contacted by the spill. It would be expected that the damage would persist because of the loss of the organisms which comprise not only part of the trophic base of the ecosystems, but the complex structure of the systems as well.

CONCLUSION: Potentially very high impacts may be sustained by Areas of Special Concern under this alternative.

CUMULATIVE IMPACTS: The most severe impacts from non OCS activities would be derived from the transportation of domestic and foreign petroleum products through the area. OCS activity, other than this alternative, which potentially could cause substantial impact on the Straits of Florida Planning Area would include the potential lease sale in the Eastern Gulf of Mexico Planning Area and the associated 1 assumed oil spill of 1,000 bbl or greater. The continuous nature of the Gulf of Mexico Loop Current and the Florida Current indicates that appreciable impact could be derived in the Straits of Florida Planning Area from a spill in the eastern Gulf.

CONCLUSION: A very high impact level is anticipated. The alternative will not increase this level, but will increase the probability of impacts occurring.

(i) Impacts on marine sanctuaries

Two marine sanctuaries are present in the Straits of Florida Planning Area; Key Largo and Looe Key. Because of the sanctuary status, destructive activities in these areas are avoided. Under this alternative, oil and gas activities would not occur within the boundaries of the sanctuaries. However, the assumed 1 oil spill of 1,000 bbl or greater could have a large negative impact on these areas.

CONCLUSION: As a result of the one assumed oil spill under this alternative, a very high level of impact is expected.

CUMULATIVE IMPACTS: The most severe cumulative impacts to the marine sanctuaries would occur as result of an oil spill. The probability of a spill of 1,000 bbl or greater is much higher for the present transportation than for the alternative.

CONCLUSION: A very high impact level is expected as a result of cumulative impacts.

(5) Socioeconomic Environment

(a) Impacts on employment and demographic conditions

The search for and discovery of oil and gas resources within the Straits of Florida Planning Area could create employment opportunities and consequently increase population levels. These changes have both positive and negative attributes thereby giving an indication of the socioeconomic well-being of communities, counties, States, and regions.

The alternative could generate a regional total of approximately 1,500 jobs during peak activity (see Section IV.B.1.a(5)(a) for references on the methodology used to derive estimate). The total employment figure represents less than .2 percent of the regions civilian labor force.

A regional peak population increase of about 3,900 persons could be associated with the projected employment increase. This represents less than .1 percent of the region's population, implying little or no significant stress on the public and private service and facilities of the region as a whole.

The population increases generated, while minimal on a regional basis, may not be uniformly insignificant throughout the region. Impacts are potentially more significant in those counties or independent cities in which direct investments of offshore-related primary activities may be located.

CONCLUSION: The level of activity associated with the alternative will result in a very low level of impact on socioeconomic factors on a regional basis, and a very low to low impact on a local basis.

CUMULATIVE IMPACTS: The State of Florida is expected to increase in population as more people migrate toward the sunbelt regions of the United States. Sunbelt growth in population is a combination of increased employment potential and retirement possibilities for individuals from the more severe winter climate sections of the United States. Expanding employment opportunities will compete with the oil and gas development of southern Florida for available labor. However, specialized skills required in the oil and gas industry should not conflict with the expansion of employment in the service industries.

Population in the nondeferred portion of the planning area is expected to increase by 79 percent by the year 2000 from the 1980 census figure of 3,854,054 (Department of Commerce, Bureau of the Census; 1983).

CONCLUSION: Employment and population in the nondeferred portion of the planning area are expected to increase dramatically in the near future. Impacts to the planning area due to this growth are expected to be high.

(b) Impact on coastal land uses and water services

The development of estimated resources in the nondeferred portion of the Straits of Florida Planning Area is likely to require a new gas pipeline and landfall, a new onshore gas processing and treatment plant, and new support base facilities. No assumptions have been made at the present time with respect to locations of these facilities.

Coastal sites, although not necessarily on the waterfront, are preferred for gas plants which could consume approximately 50-75 acres of land and over 100,000 gallons of water per day. Approximately 50 acres of land should be sufficient to accommodate a permanent support base for production activities including substantial water requirements. The South Florida Regional Planning Council has identified several potential locations for both gas plants and OCS support bases (SFRPC, 1984). In the absence of more specific information regarding facility requirements, it is anticipated that these or similar potential locations can accommodate necessary OCS-related facilities within the context of sound land use planning and environmentally sensitive resource management. Detailed siting approval and procedural requirements are expected to mitigate the impacts which may occur.

It is assumed that existing facilities serving the Gulf of Mexico will fulfill the pipe-coating requirements for this alternative. Oil produced in the Straits of Florida would be transported by tanker to existing refineries in the Delaware Bay area. No oil pipelines are anticipated. Expansion of neither the pipe-coating facilities nor the refineries will be required. Helicopter services can be located in any existing commercial airport along the coast and would not require expansion of facilities. Because these requirements can be met by existing facilities without expansion, no conflicts with land use plans or policies are anticipated.

CONCLUSION: The components of the OCS exploration and development, especially the gas pipeline and treatment plant, are expected to have moderate impacts on land use in south Florida coastal areas. All proposed activities and facilities are expected to be sited in generally compatible areas.

CUMULATIVE IMPACTS: This alternative, when combined with other reasonably foreseeable actions, has the potential for cumulative impacts which would be similar to those for the north Atlantic Planning Area [see Section IV.B.1.a(5)(b)]. This includes the potential for unplanned and uncontrolled development resulting in considerable damage to coastal resources. In addition, much greater strain on water services in South Florida would be anticipated. A variety of efforts, including land use plans and coastal management programs, if successful, will prevent or lessen such impacts.

CONCLUSION: Impacts on land use and water services could be high or very high in the cumulative case.

(c) Impacts on commercial fisheries

Under this alternative, the potential impacts would be closely aligned with those impacts associated with Section IV.B.22(4)(c). Sections IV.B.1.a(5)(c), IV.B.2.a(5)(c) and IV.B.3.a(5)(c) should be referred to for additional information.

The impacts on commercial fisheries under this alternative would primarily be a result of the assumed 1 oil spill greater than or equal to 1,000 bbl. The placement of structures and discharges of drilling muds and cuttings would have an appreciable but very localized impact. Because many of the commercial fisheries are based on species that are coral reef or live bottom oriented, an oil spill that damages these areas could have very long-lasting impacts.

CONCLUSION: A high level of impact is expected.

CUMULATIVE IMPACTS: Cummulative impacts to commercial fisheries in the non-deferred portion of the Straits of Florida Planning Area include commercial fishing, transportation of petroleum products, oil spills from eastern Gulf of Mexico lease sales, and this alternative. At this time, commercial fishing does not exert an appreciable influence on overall potential impacts. The most severe impacts would result from an oil spill in the area.

CONCLUSION: The alternative will not increase the cumulative impact level, which is high.

(d) Impact on recreation and tourism

Land use competition, visual effects, and oil spill impacts are the three major concerns relating to coastal recreation and tourism in the non-deferred portion of the Straits of Florida Planning Area. The nature of such concerns are examined in some detail in the north Atlantic section on "Impacts on Recreational Resources." [Section IV.B.2.a(5)(c)]. Much of the information and conclusion contained therein is equally applicable to the affected area of the Straits of Florida.

Development of estimated hydrocarbon resources in the nondeferred portion of the Straits of Florida Planning Area could very possibly result in a new gas processing and treatment plant and a gas pipeline right-of-way and landfall. As noted in Sections IV.B.22(1)(a) and IV.B.22(5)(c), these facilities, as well as other onshore facilities such as support bases, would need to be accommodated in compatible areas. Any onshore facilities would be sited in accordance with applicable Federal, State, local, and coastal zone land use policies. It is thus unlikely that any such facilities would be sited in an area used or suitable for coastal recreation.

The nondeferred portion of the Straits of Florida Planning Area extends seaward from State waters (3-mile limit) to approximately 150 miles offshore. The bulk of the Planning Area however, extends from 3 miles to only 30-50 miles offshore. As detailed in Section IV.B.1.a(5)(d), the theoretical extent of visibility for a typical rig (approximately 300 ft. in overall height) by a person standing onshore in 25-30 miles. Since so much of this planning area is located within this range, the potential exists for onshore visual impacts form OCS drilling activities especially if such facilities were located in the areas closest to the Florida coast or the Keys. Such impacts would depend upon favorable weather conditions and would diminish significantly with distance from shore.

Potential oil spills create what is probably the greatest concern for the recreation and tourism industry. The nature of oil spill impacts on coastal recreation areas is detailed in Section IV.B.1.a(5)(d). Again, because of the relatively narrow width of the nondeferred portion of the planning area, the potential for contact with coastal recreation areas--should a spill occur, is greater than for other more extensive OCS planning areas. Further, coastal recreation and tourism in the affected area of the non-deferred portion of the Straits of Florida are more vulnerable to oil spill impact due to the year-round rather than seasonal nature of recreational activities in the area. Nonetheless, the resource estimates for the Planning Area are such that only one spill is presumed to occur resulting from adoption of this alternative. It is not at all certain that such a spill will contact coastal recreation areas.

CONCLUSION: This alternative's impacts on coastal recreation and tourism are anticipated to be low. Certain areas may experience adverse impacts in the event of oil spill contact; however, overall impact on the region should remain low.

CUMULATIVE IMPACTS: Cumulative development of estimated resources in the nondeferred portion of the Straits of Florida resulting from adoption of this alternative for the 5-year leasing program contribute a relatively insignificant additional risk of oil spillage in the area. Existing levels of tanker transportation of other domestic (i.e., Gulf of Mexico) and imported crude oil and refined products through the nondeferred portion of the Straits of Florida Planning Area (levels which are expected to continue or possibly increase) create the substantially greater portion of oil spill risk. In the cumulative case, there is thus a greater likelihood of spill occurrence and contact with coastal recreation resources. This likelihood remains small enough, however, that still only one spill is assumed to occur in the nondeferred portion of the Straits of Florida Planning Area in the cumulative case for this alternative. It should be noted that the risks associated with ongoing transportation of crude and refined products through the area exist independent of adoption or nonadoption of this alternative.

CONCLUSION: In the cumulative case, the potential exists for moderate impacts to coastal recreation areas. These impacts, resulting from oil spills, would not tend to extend over the region as a whole.

(e) Impact on archaeological resources

(i) Prehistoric archaeological resources

The earliest undisputed date for man's occupancy of the North American continent east of the Appalachians is approximately 12,000 B.P. (years before present). Migration into southern Florida, however, occurred much later. The Cape Canaveral area did not become inhabited until about 4,000 B.P., Broward County not until about 3,000 B.P., and the Florida Keys became inhabited approximately 2,000 B.P. During this time span, sea level was within 5 m of sea level today. Consequently, there is only a narrow strip of submerged land, which is wholly within State waters, which could contain prehistoric artifacts. Because any prehistoric resources in the Straits of Florida would be outside of the planning area, the overall impact on prehistoric resources is expected to be very low.

One pipeline is projected for the planning area. Where this pipeline would come ashore, there is a potential for prehistoric resources to be affected. In those areas where prehistoric resources are most likely to exist, there is typically a fairly thick accumulation of sediments. Additionally, required surveys would minimize the chance of any prehistoric resources being affected.

Prehistoric sites located in tidally influenced areas, on the other hand, could be severely affected by an oil spill. Oil could contaminate prehistoric artifacts, and oil spill cleanup operations could disturb or destroy artifacts. Processing and storage facilities at onshore locations could result in the damage or destruction of prehistoric archaeological resources. However, the probability of this occurring is remote, as State and environmental regulatory agencies have opportunities to review plans for onshore development related to offshore oil and gas activity.

(ii) Historic archaeological resources

Historic archaeological resources include shipwrecks or sunken aircraft offshore, or historic buildings, sites, bridges, and districts onshore.

Potential impacts on shipwrecks are both positive and negative in nature. Exploratory activities might result in identification of previously unknown wrecks. However, the magnetic signature of the dispersed remains of a shipwreck could easily be masked by a platform or pipeline near the shipwreck. Any objects placed on the ocean floor may crush a fragile wooden wreck. Finally, spilled oil could contaminate a shipwreck and, oil spill cleanup operations could damage or destroy a wreck.

Many potentially negative impacts on historic archaeological resources could probably be avoided through the use of information obtained during predrilling surveys. Shipwrecks could be located through predrilling surveys required under OCS Operating Order No. 2, and, once identified, could be avoided by means of directional drilling and other techniques.

Shipwrecks tend to be concentrated on the very narrow (less than 10 mi wide) shelf in the Straits of Florida. Although the major area of interest has not been established yet, only one platform is assumed in this alternative.

If a shipwreck is located in the path of the natural gas pipeline, damage to or destruction of the resource could occur. However, before a pipeline route is actually decided upon, a survey would be required. Such surveys, conducted with sidescan sonar, sub-bottom profiler, and possibly magnetometer, could locate many shipwrecks which might be present in the proposed corridor. The pipeline could then be realigned in order to avoid possible conflicts.

Because the majority of historic structures in the immediate tidal zone are protected by bulwarks or other barriers, damage from an oil spill would be largely esthetic in nature. Additionally, any historic sites eligible for, or listed on, the National Register of Historic Places are afforded protection under the National Historic Preservation Act of 1966, as amended. The siting of OCS-related facilities at onshore locations could adversely affect historic archaeological resources. However, because State and environmental regulatory agencies have opportunities to review plans for onshore development related to offshore oil and gas activity, the probability of this occurring is very remote.

CONCLUSION: Impacts on archaeological resources located within the planning area, in onshore areas, and along pipeline rights-of-way are expected to be very low.

CUMULATIVE IMPACTS: Activities not associated with OCS oil and gas development resulting from this proposal would appear to present a higher probability of negative impact on archaeological resources, both prehistoric and historic, within the nondeferred portion of the Straits of Florida Planning Area. Such activities include the transport by tanker of crude and refined petroleum imports through the region, onshore facility construction, trawling, sport diving and commercial treasure hunting, and channel dredging. Because there is a greater probability of an oil spill resulting from the continued importation of oil at present levels, historic shipwrecks and/or prehistoric sites could be contacted by an oil spill. Subsequent cleanup operations could damage or destory the wrecks and/or sites. Construction of non-OCS-related onshore facilities could result in the damage or destruction of both prehistoric and historic archaeological resources. However, the impacts could be mitigated through compliance with a variety of permitting requirements, the coastal zone management programs of the affected States, and the National Historic Preservation Act of 1966. Because trawling by fishermen would affect only the uppermost portion of sediments, the risk to potential prehistoric sites would be low. With respect to historic shipwrecks, it is likely that the zone of disturbance would have already been affected by natural forces. While sport and commercial diving would probably have little impact on potential prehistoric sites, the removal of historic material from shipwrecks could be very damaging. Because most channel dredging takes place near the entrance to inlets and ports, both prehistoric and historic resources could be severely affected by such activities. This is because areas near the shoreline generally have a higher probability of containing archaeological resources than do areas further offshore. However, a mitigating measure would be the Army Corps of Engineers (COE) requirement that remote sensing surveys be conducted prior to dredging operations in many areas.

CONCLUSION: Impacts on archaeological resources could range from low to moderate because of the aggregate of varied activities occurring within the planning area.

(f) Impact on marine vessel traffic and offshore infrastructure

The increase in marine vessel traffic and the load on the offshore infrastructure that would be caused by this proposed action would amount to a very small percentage of the total activity in the nondeferred portion of the Florida Straits Planning Area.

CONCLUSION: The impact on marine vessel traffic and offshore infrastructure is expected to be very low.

CUMULATIVE IMPACTS: The vessel activity and structure placement associated with this proposed action represents a very small percentage of all activities that may have an impact on marine vessel traffic and offshore infrastructure.

CONCLUSION: A very low level of impact is expected on marine vessel traffic and offshore infrastructure.

(g) Impact on military uses

Potential use conflicts exist between OCS oil and gas activities and military operations because substantial parts of the Florida Straits Planning Area are used for various military operations. The specific military operating areas and activities that occur within the planning area are described in Section IV.22.a(2)(b) (Figure III.A.4.a.6-1).

Nine exploration and delineation wells would be drilled, and one platform would be established as a result of this proposed action. This would represent a small percentage of the marine activities taking place in the region.

CONCLUSION: Impact on military uses would be very low.

CUMULATIVE IMPACTS: This proposed action represents only a very small percentage of the marine activities taking place within the non-deferred portion of the Florida Straits Planning Area that may conflict with planned military operations. No serious conflicts have ever arisen and none are expected.

CONCLUSION: Cumulative impacts are expected to be very low.

V. CONSULTATION AND COORDINATION

A. Consultation and Coordination During Development of the Proposal

Under the procedural requirements of section 18, of the Outer Continental Shelf (OCS) Lands Act as Amended, the development of the new program takes about two years. The initiation of development of the new program was announced in letters to the Governors of coastal States and to interested Federal Agencies, dated July 5, 1984, and in a Federal Register Notice published on July 11, 1984, (49 FR 28332). The Secretary's selection of a Draft Proposed Program was announced in letters to the Governors of coastal States and to interested Federal Agencies dated March 19, 1985, and in a Federal Register Notice published on March 22, 1985 (50 FR 11585).

The Draft Proposed Program selection revised the description of the program publicized in July 1984 by establishing outer boundaries for planning areas, reconfiguring the OCS from 24 to 26 planning areas by dividing the South Atlantic into two areas (South Atlantic and Straits of Florida) to allow a more concentrated review of those areas, and reconfiguring the planning areas offshore California from two to three to allow a more concentrated section 18 review, as well as to respond to public comments requesting such a change.

The Proposed Program will be the second of three stages the Secretary is required to develop in the process of formulating the 5-Year OCS Leasing Program. Review copies of the Draft Proposed Program were issued to the Governors of coastal Sttes, affected Federal agencies, and the public in March 1985. In early 1986, the second stge, the Proposed Program is scheduled to be submitted for review to those same parties and to the Attorney General and Congress. The third stage, the Proposed Final Program, is scheduled for transmittal to the President and Congress in early 1987 with final approval by the Secretary slated for 60 days thereafter.

B. Consultation During Development of the EIS

This environmental impact statement (EIS) was prepared by the Washington Office of the MMS. Chapter III, The Affected Environment, and Chapter IV, Environmental Consequenses, those chapters needing the input of individuals most familiar with the environments of the planning areas, were prepared by the environmental analysts in each of the four MMS Regional offices. Information used in the preparation of this EIS was obtained from a number of sources. Sale specific documents prepared, or which are in preparation, for individual lease sales are an important source of data on the affected environment, the resources which have been of concern in the past, the factors which may affect those resurces, and how those resources are affected by various offshore activities, and how the resources of planning areas have been affected in the past.

Also, as is the case with a sale specific environmental statement, additional information is obtained from contacts established in the past within the academic community, Federal agencies, State and local governments, and the oil and gas industry. These contacts are important for making sure that the latest information is being used in the analysis.

The Notice of Intent to prepare this EIS was published in the Federal Register in a Notice published on March 22, 1985, (50 FR 11585) along with the announcement of the Secretary's selection of a Draft Proposed Program. Responses to this Notice, as well comments which were submitted on the Draft Proposed Program were also used in the preparation of this EIS.

The scope of the EIS was determined by representatives of the MMS Regional and Washington offices, using scoping comments provided in response to the Notice of Intent, in close coordination with Regional office environmental analysts, and along with careful review of the Draft Proposed Program. See Section I.E. for a full discussion on scoping.

Certain types of consultation or analysis is most appropriately done during the pre-sale process carried out for individual proposed lease sales. These are consultations or analyses which require information available only after the area of the proposed sale has been identified, and more specific estimates of the expected resources, their probable locations, and the estimates of the activities needed to recover those resources have been developed. These types of analyses cannot, therefore, be carried out for a document such as this, which covers only the most general aspects of the sales and emphasizes the 5-year schedule instead. These analyses and consultation efforts are:

- Oil Spill Trajectory Analysis. This analysis is done in the form of a complex model which estimates the possible paths of oil spills which might occur in various parts of the planning area. The analysis is done based on the most recent resource estimates, and using the most up to date oceanographic data available. For more information on the oil spill analysis see Section IV.A.4.a.

- Air Quality Analysis. Air quality analyses also make use of a model, such as the Reactive Air Pollutant Transport model. This type of analysis has been carried out in the Southern California planning area. This analysis is carried out during sale specific environmental analysis and even more detailed study is carried out in the analysis done for exploration and development plans in Southern California.

- Endangered Species Consultation. Section 7(a)(2) of the Endangered Species Act requires that any action authorized, funded, or conducted by a Federal Agency (unless specifically exempted through a process detailed in the Act) is not likely to jeopardize the continued existence of endangered or threatened species or result in the destruction or adverse modification of their critical habitat. The National Marine Fisheries Service (NMFS) is responsible for the protection and conservation of eight species of large whales and five species of marine turtles. The U.S. Fish and Wildlife Service (FWS) is responsible for sea otters in California, manatees in the southeastern United States, Marine turtles (while on land), and terrestrial plant and animal species. A Federal "action" Agency must consult with the "resource agencies" (NMFS and/or FWS) when species under their respective jurisdictions may be affected by a proposed action. A resource agency must issue its biological opinion on whether or not an action would likely jeopardize a species "promptly after conclusion" of a 90-day formal consultation period, but a longer (or shorter) consultation period is permitted if mutually agreeable to the resource and action agencies. If a resource agency claims that a jeopardy situation exists, it must identify reasonable and prudent alternatives to the action that would preclude jeopardy.

The Minerals Management Service (MMS) has conducted with the NMFS and FWS regionwide or subregionwide formal consultations for oil and gas leasing in all OCS planning areas identified in previous 5-year leasing programs. The MMS also customarily formally consults with them on oil and gas leasing and exploration for each lease sale except in the western and central Gulf of Mexico where, following formally requested evaluation, these resource agencies have affirmed on a case-by-case basis the continued validity of earlier biological opinions. For "frontier" areas in the Alaska and Pacific OCS Regions, the MMS furnishes copies of lessees' exploration plans to the involved NMFS and FWS regional offices for review. If exploration results warrant development and production, the MMS also consults formally with the NMFS and FWS on plans of development and production recieved from the lessee/applicant. The results of all these consultations are factored, as appropriate, into the decisions that the Department or the MMS makes relevant to the specific action or activity it may authorize or approve.
-The Alaska National Interest Lands Conservation Act. Section 810 of the Alaska National Interest Lands Conservation Act (ANLICA), (16 U.S.C. 3120) creates special steps a Federal Agency must take before it decides to "withdraw, reserve, lease, or otherwise permit the use, occupancy, or disposition of public land." Specifically, the Agency must first evaluate three factors: the effect of its action on subsistence uses and needs, the availability of other lands for the purposes sought to be achieved, and alternatives which would "reduce or eliminate the use, occupancy, or disposition of public lands needed for subsistence purposes." If the Agency concludes that its action "would significantly restrict subsistence uses," it must notify the appropriate State agency, regional council, and local committee. It then must hold a hearing in the vicinity of the area involved, and must make three findings:

> that (A) such a significant restriction of subsistence uses is necessary, consistent with sound management principles for the utilization of public lands, (B) the proposed activity will involve the minimal amount of public lands necessary to accomplish the purpose of such use, occupancy, or other disposition, and (C) reasonable steps will be taken to minimize adverse impacts upon subsistence uses and resources resulting from such actions. 16 U.S.C. 3120(a)(3).

In People of the Village of Gambell v. Clark, 746 F.2d 572 (9th Cir. 1984) (Gambell I), the court ruled that the "lands and waters" of the OCS were "public lands" for the purpose of this section. The court later ruled that the provisions of section 810 should not be applied in a staged manner, despite the staged decisionmaking approach set out in the OCS Lands Act and relied upon by the Supreme Court in Secretary of the Interior v. California, 464 U.S. 312, 325-342 (1984). People of the Village of Gambell v. Hodel, Civ. No. 85-3877 (9th Cir. Oct. 25, 1985). As a result of these rulings, the Interior Department prepares an analysis under section 810 of ANILCA for lease sales and plans of exploration and development/production for activities offshore of Alaska. The provisions of ANILCA do not apply to the 5-Year Program at this stage because the Department does not make any of the prescribed decisions.

Copies of this EIS have been distributed to the following Federal Agencies.

Environmental Protection Agency
Detartment of Commerce, National Oceanic and Atmospheric Administration
Department of Energy
Nuclear Regulatory Commission
Marine Mammal Commission
Department of Defense
Department of Transportation
U.S. Coast Guard
Department of State
Department of the Interior

The Governors and Clearinghouses of the following States have also been provided with copies.

Alabama
Alaska
California
Connecticut
Delaware
Florida
Georgia
Louisiana
Maine
Maryland
Massachusetts
Mississippi
New Hampshire
New Jersey
New York
North Carolina
Oregon
Rhode Island
South Carolina
Texas
Virginia
Washington

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VII. PRINCIPAL PREPARERS

LIST OF PREPARERS

ATLANTIC PLANNING AREAS

Beckert, Heino	Senior Physical Scientist
Benner, Colleen	Biological Oceanographer
Bornholdt, David	Fisheries Biologist
Callan-Timm, Melany	Senior Physical Scientist
Drucker, Barry	Geological Oceanographer
Francois, Darryl	Physical Scientist
Good, Keith	Physical Scientist
Gould, Gregory	Physical Scientist
Gray, Frederick	Minerals Leasing Specialist
Hurwitz, Norman	Regional Economist
Martin, John	Economist
Middleton, Robert	Biological Oceanographer
Notario, Jose	Physical Oceanographer
Schultz, David	Chemical Oceanographer

GULF OF MEXICO PLANNING AREAS

Brown, Murray	Oceanographer
Christopher, Joseph	Geographer
Froomer, Norman	Geomorphologist
Gabanski, Laura	Oceanographer
Handley, Lawrence	Geographer
Hill, Charles, Jr.	Marine Biologist
Holt, Jack	Community Planner
Hunt, Jesse	Geologist
Johnstone, William	Community Planner
Landry, Elgin	Meterologist
Lehman, Jacob	Fish and Wildlife Biologist
Reggio, Villere, Jr.	Recreation Planner
Reinhardt, Janet	Geographer
Rodi, John	Economist
Rouse, Mark	Oceanographer
Stright, Melanie	Archaeologist
Tabberer, Daniel	Wildlife Biologist
Vaughan, Cheryl	Marine Biologist
Zatarain, Vicki	Economist

CALIFORNIA PLANNING AREAS

Agnolet, Debra	Geologist
Brewer, Donna	Wildlife Biologist
Brewer, Gary	Oceanographer
Gillard, Bob	Biological Oceanographer
Hampton, George	Geographer

Herkhof, Dirk	Meteorologist
Karpas, Robert	Environmental Scientist
Purvis, Jesse	Fisheries Biologist
Watt, Alex	Geographer
Rynas, Steve	Community Planner
Larson, Sigmund	Oceanographer
ALASKA PLANNING AREAS	
Adams, Allan	Physical Scientist
Armstrong, Helen	Social Economic Specialist
Bennett-Walters, M.	Sociologist
Dubsky, Paul	Biologist
Hansen, Don	Wildlife Biologist
Holland, Ken	Fish and Wildlife Biologist
Hubbard, Joel	Wildlife Biologist
Irvine, Gail	Fisheries Biologist
Johnston, Debby	Wildlife Biologist
King, Fred	
Kubanis, Susan	Fish and Wildlife Biologist
Lockert, Jon	Economist
McCrea, Maureen	Social Science Analyst
Meyer, Robert	Fisheries Oceanographer
Newbury, Tom	Oceanographer
Prentki, Dick	Oceanographer
Roberts, Dick	Oceanographer
Seidl, Jim	Environmental Specialist
Springer, Gil	Geological Oceanographer
Tornfelt, Evert	Social Science Analyst
Treacy, Steve	Wildlife Biologist
Tremont, John	Environmental Specialist
Weinhold, Bob	Fisheries Biologist
Wheeler, Gary	Endangered Species Specialist
Yankus, Glenn	Social Science Analyst
WASHINGTON OFFICE	
Cook, Larry	Geologist
Gasdaglis, Nick	Petroleum Engineer
Henry, Daniel	Geographer
Labelle, Robert	Biologist
Lewis, Jackson	Biologist
Melancon, Archie	Geographer
Valiulis, George	Oceanographer
Winnor, Richard	Biologist

APPENDIX A
Definitions Assumed in Impact Assessment

Definitions Assumed in Impact Assessment
- Air Quality
- Archaeological Resources
- Benthic Population
- Commercial and Recreational Fisheries
- Employment
- Endangered and Threatened Species
- Fish Resources
- Land Use and Coastal Management
- Marine Mammals and Birds (non-endangered species)
- Marine Transportation and Ports
- NASA/DOD
- Ocean Dumping
- Planktonic Populations
- Recreation and Tourism
- Sensitive Habitats (areas of special regional concern)
- Sociocultural Systems
- Subsistence
- Visual Resources
- Water Quality

Air Quality

Very High - Widespread areas within a Federal nonattainment area will be impacted by both onshore and offshore sources. Uncontrolled emissions from OCS activities will probably cause a reclassification of an attainment area to nonattainment status or cause an exceedance of the applicable Federal PSD increment for an attainment area. Large emission control and offset costs were likely.

High - Several areas within a Federal nonattainment area or widespread areas within a Federal attainment area will be impacted by both onshore and offshore sources. Uncontrolled emissions from OCS activities may cause a reclassification of an attainment area to nonattainment status or cause an exceedance of the applicable Federal PSD increment for an attainment area. Large emission controls and/or offset costs are likely.

Moderate - A few areas within a Federal nonattainment area or several areas within a Federal attainment area will be impacted by both onshore and offshore sources. Uncontrolled emissions from OCS activities will not cause a reclassification of an attainment area to nonattainment status or cause an exceedance of the applicable Federal PSD increment for an attainment area. Some emission controls and/or offset costs are likely.

Low - One small area within a Federal nonattainment area or a few areas within a Federal attainment area will be impacted by both onshore and offshore sources. Few emission control strategies are likely.

Very Low - No areas within a Federal nonattainment area or one small area within a Federal attainment area will be impacted by both onshore or offshore sources. No emission control strategies are likely.

Archaeological Resources

Very High - An archaeological site will be altered to the extent that it will lose all of the physical features which would yield scientific data.

High - An archaeological site will be altered to the extent that it will lose all of the physical features which would yield valuable data, but some information will be recoverable.

Moderate - An archaeological site will be altered but retain the integrity and basic physical features capable of yielding valuable data.

Low - An archaeological site will be disturbed but retain the majority of the features which give it scientific integrity.

Very Low - An archaeological site will be disturbed but lose only minor amounts of information.

Benthic Populations

Very High -	A population declines in the affected area resulting in a change in the distribution and/or abundance of the species in the local area and/or the planning area. The expected duration of the effects within the local area and/or the planning is more than three generation 5 or 10 years or more.
High -	A population declines in the affected area resulting in a change in the distribution and/or abundance of the species in the local area and/or the planning area. The expected duration of the effects within the local area and/or the planning is two or three generations or 6 to 9 years.
Moderate -	A population declines in the affected area resulting in a change in the distribution and/or abundance of the species in the local area and/or the planning area. The expected duration of the effects with the local area and/or planning is one generation or 3 to 5 years.
Low -	A population declines in the affected area resulting in a change in the distribution and/or abundance of the species in the local area and/or the planning area. The expected duration of the effects within the local area and/or the planning is less than one generation or 1 to 3 years.
Very Low -	No discernable lethal effects, but individuals experience sublethal effects which cause reduced biogenic activity or reduced metabolic functions. Organisms would recover to pre-impact condition within one generation or 1 to 3 years.

*A generation is the term of years accepted as the average period between the birth of the parents and the birth of their offspring (Random House Dictionary).

Commercial and Recreational Fisheries

Very High - Significant economic losses, i.e., greater than 30 percent, lasting two or more seasons with significant losses in secondary employment.

High - Measurable economic losses lasting more than two seasons with measurable economic losses in secondary employment.

Moderate - Measurable economic losses lasting only one or two seasons with measurable economic losses in secondary employment.

Low - Measurable economic losses which last for one or two seasons with no measurable economic loss in secondary employment.

Very Low - Losses are not measurable against natural fluctuations in fish and shellfish stocks; economic losses are limited to a few fishermen and the duration of the impact is 1 year or less.

Employment

Very High - The total employment generated by OCS activity (both direct and indirect) in the peak year of OCS employment accounts for more than 20 percent of the projected level of employment of the affected area or a shift in the projected level of employment mix of the local labor force takes place.

High - The local employment generated by OCS activity (both direct and secondary) in the peak year OCS employment accounts for more than 10% but no more than 20% of the projected level of employment of the affected area or a small but significant shift in the projected employment mix of the local labor force takes place.

Moderate - The local employment generated by OCS activity (both direct and secondary) in the peak year of OCS employment accounts for more than 5% but no more than 10% of the projected level of employment of the affected area and no significant change in the projected employment mix of the local labor force takes place.

Low - The total employment generated by OCS activity (both direct and secondary) in the peak year of OCS employment accounts for more than 1% but no more than 5% of the projected level of employment of the affected area and no significant change in the projected employment mix of the local labor force takes place.

Very Low - The total employment generated by OCS activity (both direct and secondary) in the peak year of OCS employment accounts for 1% or less of the projected employment for the affected area and no significant change in the projected employment mix of the local labor force takes place.

Endangered and Threatened Species

Very High - A population declines in the affected area resulting in a change in the distribution and/or abundance of the species in the local area and/or the planning area. The expected duration of the effects within the local area and/or the planning area is more than three generations* or 10 years or more.

High - A population declines in the affected area resulting in a change in the distribution and/or abundance of the species in the local area and/or the planning area. The expected duration of the effects within the local area and/or the planning area is two or three generations or 6 to 9 years.

Moderate - A population declines in the affected area resulting in a change in the distribution and/or abundance of the species in the local area and/or the planning area. The expected duration of the effects within the local area and/or the planning area is less than one generation or 3 to 5 years.

Low - A population declines in the affected area resulting in a change in the distribution and/or abundance of the species in the local area and/or the planning area. The affected duration of the effects within the local area and/or planning area is less than one generation or 1 to 3 years.

Very Low - No discernable lethal effects, but individuals experience sublethal effects which cause reduced biogenic activity or reduced metabolic functions. Organisms would recover to pre-impact condition within one generation or 1 to 3 years.

*A generation is the term of years accepted as the average period between the birth of the parents and the birth of their offspring (Random House Dictionary, 1982).

Fish Resources

Very High - A population declines in the affected area resulting in a change in the distribution and/or abundance of the species in the local area and/or the planning area. The expected duration of the effects within the local area and/or planning area is more than three generations* or 10 or more years.

High - A population declines in the affected area resulting in a change in the distribution and/or abundance of the species in the local area and/or the planning area. The expected duration of the effects within the local area and/or planning area is two or three generations or 6 to 9 years.

Moderate - A population declines in the affected area resulting in a change in the distribution and/or abundance of the species in the local area and/or the planning area. The expected duration of the effects within the local area and/or planning area is one generation or 3 to 5 years.

Low - A population declines in the affected area resulting in a change in the distribution and/or abundance of the species in the local area and/or the planning area. The expected duration of the effects within the local area and/or planning area is one generation or 1 to 2 years.

Very Low - No discernable lethal effects, but individuals experience sublethal effects which cause reduced biogenic activity or reduced metabolic functions. Organisms would recover to pre-impact condition within one generation or 1 to 3 years.

*A generation is the term of years accepted as the average period between the birth of the parents and the birth of their offspring (Random House Dictionary).

Land Use and Coastal Management

Very High - Existing onshore facilities present and/or proposed land use cannot be modified to support the proposed offshore activities. An amendment to the local State and Federal coastal programs will be needed before the construction of new offshore facilities related to oil and gas activities can procede.

High - Existing onshore facilities or present and proposed land uses cannot be modified to support the proposed offshore oil and gas development. The land identified for development has been evaluated by the local State and Federal coastal programs. The intended use of the land will involve a change in use from one type of development to another, or may involve the development of vacant land.

Moderate - Existing onshore facilities or present and proposed land uses can be modified but will result in other users being displaced or in additional discernable negative impacts on adjacent land uses. The land identified for development has been identified in the Local, State, or Federal coastal programs as suitable for onshore oil and gas related development.

Low - Existing onshore facilities present and proposed can be modified to support the proposed offshore activities. There will not be a discernible impact on adjacent land uses by expanded use of the existing onshore facilities.

Very Low - Existing onshore facilities present and proposed are adequate to support the proposed offshore activities. There will not be an additional impact on adjacent land uses by expanded use of the existing onshore facilities.

Marine Mammals and Birds (non-endangered species)

Very High - A population declines in the affected area resulting in a change in the distribution and/or abundance of the species in the local area and/or the planning area. The expected duration of the effects within the local area and/or the planning area is more than three generations* or 10 years or more.

High - A population declines in the affected area resulting in a change in the distribution and/or abundance of the species in the local area and/or the planning area. The expected duration of the effects within the local area and/or the planning area is two to three generations or 6 to 9 years.

Moderate - A population declines in the affected area resulting in a change in the distribution and/or abundance of the species in the local area and/or the planning area. The expected duration of the effects within the local area and/or the planning area is one generation or 3 to 5 years.

Low - A population declines in the affected area resulting in a change in the distribution and/or abundance of the species in the local area and/or the planning area. The expected duration of the effects within the local area and/or the planning area is less than one generation or 1 to 2 years.

Very Low - No discernable lethal effects, but individuals experience sublethal effects which cause reduced biogenic activity or reduced metabolic functions. Organisms would recover to pre-impact condition within one generation or 1 to 3 years.

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* A generation is the term of years accepted as the average period between the birth of the parents and the birth of their offspring (Random House Dictionary).

Marine Transportation and Ports

Very High - The proposed results in such a large increase in traffic that existing harbors, harbor access channels, infrastructure and development space is not adequate.

High - The proposal results in traffic increases that require additional docks, berths, and facilities. Traffic-congestion problems in and near harbor access channels would necessitate changes in traffic patterns.

Moderate - The proposal results in traffic increases that require new facilities, compatible with planned expansion. Traffic congestion increases, but no changes in traffic patterns would be necessary.

Low - The proposal results in traffic increases. Minor expansion of existing facilities is required; and there is a slight increase in traffic congestion.

Very Low - The proposal results in few, if any, traffic increases. No expansion of existing facilities would be necessary; and traffic congestion would not increase noticeably.

NASA/DOD

Very High -	The level and location of offshore oil and gas activity is such that critical NASA/DOD offshore activities must be eliminated, or completely shifted from the planning area causing the relocation or closure of major onshore facilities (launch centers, training bases, home ports).
High -	The level and location of offshore oil and gas activity is such that critical NASA/DOD offshore activities must be eliminated, sharply reduced, or completely shifted from the planning area, causing the relocation of certain functions from one onshore facility to another.
Moderate -	The level and location of offshore oil and gas activity cause a major involuntary* modification of NASA/DOD offshore activities, reductions in the level of activity, long-term delays, or shifts of areas of operation within the planning area.
Low -	The level and location of offshore oil and gas activity will cause slight modification of some NASA/DOD offshore activities, slight reductions in activity, and short-term delays. There would be minor changes in operational area configurations.
Very Low -	The level and location of offshore oil and gas activity will cause occasional short-term delays and modifications to some NASA/DOD offshore activities but would require no shift in areas of operations.

* Involuntary modifications are those not agreed to under the Memorandum of Agreement between DOI and DOD.

Ocean Dumping

Very High - Operations prohibit use of area designated as ocean dumpsite; or disturb dumpsite bottom (seafloor) resulting in severe water quality contamination over an extensive area or likely contact with hazardous materials (e.g., undetonated explosives, chemical munitions, radioactive wastes); or cause severe degradation of water quality within extensive area as a result of synergistic interaction of operational discharges with ocean-dumped waste.

High - Operations considerably constrain use of area designated as ocean dumpsite; or disturb dumpsite bottom resulting in temporary water quality contamination over an extensive area or contact with hazardous materials; or cause temporary degradation of water quality within extensive area as a result of synergistic interaction of operational discharges with ocean-dumped waste.

Moderate - Operations result in limited conflict with use of area designated as ocean dumpsite resolvable through coordination and planning; or disturb dumpsite bottom resulting in temporary degradation of water quality locally or possible but unlikely contact with hazardous materials; or cause temporary degradation of water quality locally as a result of synergistic interaction of operational discharges with ocean-dumped waste.

Low - Operations cause very little and easily resolvable conflict with use of area designated as ocean dumpsite; or disturb dumpsite bottom resulting in temporary degradation of water quality locally, or possible, but very unlikely, contact with hazardous materials or cause temporary degradation of water quality locally as a result of synergistic interaction of operational discharges with ocean-dumped waste.

Very Low - Operations cause no conflict with existing or proposed dumpsites, but may disturb bottom previously used for disposal of non-hazardous waste resulting in temporary degradation of local water quality.

Planktonic Populations

Very High - A population declines in its known abundance and/or distribution and recovery does not occur for over 3 years.

High - A population declines in its known abundance and/or distribution and recovery requires up to 3 years.

Moderate - A population declines in its known abundance and/or distribution and recovery requires 1 to two years.

Low - A population declines in its known abundance and/or distribution and recovery occurs within 1 year.

Very Low - Individuals of a population become subject to sub-lethal effects and the consequences do not persist.

Recreation and Tourism

Very High - Complete closure of public water-oriented recreational facilities for most or all of the peak season for recreation and tourism.

High - Complete closure of public water-oriented recreational facilities for a short period during the peak season, or a partial closure for most or all of the peak season.

Moderate - Complete closure of public water-oriented recreational facilities for a short period or partial closure for an extended period during other than peak times for recreational facilities and tourism.

Low - Partial closure of public water-oriented recreational facilities for a short period at any time of year.

Very Low - No closure of public water-oriented recreational facilities. Minor or no inconvenience to tourists and recreationists. No identifiable economic losses to the tourist industry.

Sensitive Habitats (Areas of Special Regional Concern)

Very High - An interference with ecological relationships which adversely affects communities for more than nine years before these communities can regenerate their pre-effect conditions.

High - An interference with ecosystems with changes in communities persisting for 6 to 9 years.

Moderate - An interference with ecosystems and changes in communities occupying identified sensitive habitat areas persist 3 to 6 years.

Low - An interference with ecological relationships adversely affects the communities occupying identified sensitive habitat areas for 1 to 3 years before return to pre-effect conditions.

Very Low - Effects are sublethal resulting in no measurable changes in communities occupying identified sensitive habitat areas.

Sociocultural Systems

Very High - More than 10 years chronic disruption of local sociocultural systems occurs with a tendency toward displacement of existing institutions.

High - Long-term (5 years to 10 years) chronic disruption of local sociocultural systems occurs without a tendency toward the displacement of existing institutions.

Moderate - Long-term (5 years to 10 years) chronic disruption of local sociocultural systems occurs without a tendency toward the displacement of existing institutions.

Low - Short-term disruption of local sociocultural systems occurs without a tendency toward the displacement of existing institutions.

Very Low - Periodic disruption of local sociocultural systems occurs without apparent effects.

Subsistence

Very High -	More than two important subsistence resources would become locally unavailable for a period of time exceeding 2 years.
High-	One or two important subsistence resources would become locally unavailable for 1 to 2 years.
Moderate -	One or more important subsistence resources would become locally unavailable for a period of time not exceeding 1 year.
Low -	Subsistence resources would be affected for a period of less than 1 year, but no resource would become unavailable.
Very Low -	A small number of individual fish or wildlife resources would be affected but with no apparent effects on subsistence harvests.

Visual Resources (Pacific Region Only)

Very High - Visual quality is reduced to an extent that affects all the people in the area; recreational use of the area is greatly altered and a reduction in property values occurs.

High - Visual quality is changed to an extent that affects most people in the area; recreational use of the area is altered and a reduction in property values is likely.

Moderate - Visual quality is changed to an extent that affects about half the people in the area; recreational use is not noticeably reduced and no reduction in property values occurs.

Low - A slight change in visual quality occurs; most people accept the change and no reduction in recreational use or property values occurs.

Very Low - No measurable change in visual quality occurs; few people notice changes, and there is no change in recreational use or property values.

Water Quality

Very High - Water quality parameters for regulated pollutants change by more than four orders of magnitude. Toxic trace metals or hydrocarbons exceed EPA safe levels. Changes persist more than a month.

High - Water quality parameters for regulated pollutants change by three to four orders of magnitude. Toxic trace metals or hydrocarbons exceed EPA water quality criteria. Changes persist for 2 weeks to a month.

Moderate - Water quality parameters change by two to three orders of magnitude; toxic metals or hydrocarbons occur in elevated concentrations but do not exceed EPA water quality criteria. Changes persist for several days to 1 or 2 weeks.

Low - A few water quality parameters, toxic trace metals, or hydrocarbons are elevated by not more than two orders of magnitude. Changes last only a few days.

Very Low - Water quality parameters, toxic trace metals, and hydrocarbons show no statistically significant elevations in concentration.

APPENDIX B
Air Quality Regulations

2. Preamble, 30 CFR 250.34, Exploration, Development, and Production Activities, 44 FR 53686, September 14, 1979.

DEPARTMENT OF THE INTERIOR

Geological Survey

30 CFR Part 250

Oil and Gas and Sulphur Operations in the Outer Continental Shelf

AGENCY: Department of the Interior, U.S. Geological Survey.

ACTION: Final Rule

SUMMARY: This rule incorporates the modifications of 30 CFR 250.34 required to conform to the Outer Continental Shelf (OCS) Lands Act Amendments of 1978, 92 stat. 629 (herein referred to as the "Act"). A proposed rule was published on January 17, 1979, in the Federal Register (44 FR 3513). The proposed rule described modifications in existing practices and procedures related to (1) exploration activities on OCS oil and gas leases, (2) coordination and consultation with the Governors of affected States and the executives of affected local governments, and (3) development and production activities on OCS oil and gas leases. Issuance of this rule implements the changes that are needed to make the provisions of section 250.34 consistent with the Act.

DATES: This rule becomes effective December 13, 1979.

ADDRESSES: A copy of 30 CFR 250.34 may be obtained from the following offices of the Geological Survey:

Director, U. S. Geological Survey; National Center—Mail Stop 620, Reston, Virginia 22092.

Consevation Manager—Eastern Region, U.S. Geological Survey, 1725 K Street, N.W., Suite 204, Washington, D.C. 20244.

Conservation Manager—Gulf of Mexico Region, U.S. Geological Survey, 336 Imperial Office Building, P.O. Box 7944, Metairie, Louisiana 70010.

Conservation Manager--Western Region, U.S. Geological Survey, 345 Middlefield Road, Menlo Park, California 94205.

Area Oil and Gas Supervisor--Pacific Area, U.S. Geological Survey, 1340 West Sixth Street, Room 160, Los Angeles, California 90017.

Area Oil and Gas Supervisor--Alaska Area, U.S. Geological Survey, 800 "A" Street, Suite 109, Anchorage, Alaska 99501.

FOR FURTHER INFORMATION CONTACT:

Gerald D. Rhodes, Branch of Marine Oil and Gas Operations, Conservation Division, Mail Stop 620, U.S. Geological Survey, National Center, Reston, Virginia 22092, (703) 860-7531.

SUPPLEMENTARY INFORMATION

Background: Rules establishing practices and procedures under which the U.S. Geological Survey (herein referred to as the "Survey") makes information contained in exploration plans and development and production plans available to affected States, executives of affected local governments, and other interested parties were published January 27, 1978 (43 FR 3880). Those practices and procedures were set out in a revised § 250.34 of Title 30 of the Code of Federal Regulations. On September 18, 1978, the OCS Lands Act Amendments of 1978 were enacted (Public Law 95-372). Certain provisions of the Act required revision of the regulations published January 27, 1978. By notice of November 1, 1978 (43 FR 50903), the Department of the Interior temporarily suspended certain provisions of 30 CFR 250.34 pending full implementation of the Act. A proposed rule incorporating the modifications of § 250.34 was published January 17, 1979 (44 FR 3513). In addition, on May 10, 1979, proposed modifications to 30 CFR 250.34 were published to implement the requirement of section 5(a)(8) of the Act that the Secretary of the Interior issue regulations which provide for compliance with the national ambient air quality standards pursuant to the Clean Air Act (42 U.S.C. 7401, et seq.) to the extent that activities authorized under the Act significantly affect the air quality of any State. Those modifications are being developed under a separate rulemaking activity.

Comments: A total of 50 sets of comments and recommendations were timely submitted in response to the invitation contained in the notice of proposed rule published January 17, 1979. Comments and recommendations were received from 2 private citizens, 5 public interest groups, 12 State and local government agencies, and 31 oil and gas companies and trade organizations.

Public Hearings: Oral testimony relating to the proposed revisions of 30 CFR 250.34 was also taken at public hearings held in Los Angeles, California; New Orleans, Louisiana; and Washington, D.C.

Differences Between Proposed Rule and Final Rule: The differences between the provisions of the final rule and the provisions of the proposed rule are the result of the Department's efforts to incorporate the comments of the public, to make the provisions of the final rule more clear, and to assure conformance with the Act. In this regard, special attention has been given to the specific provisions of sections 5, 11, 19, 21, and 25 of the Act (43 U.S.C. 1334; 1340; 1345; 1333; and 1351 respectively).

DISCUSSION OF MAJOR COMMENTS

General Comments: (1) Duplication of efforts. Several respondents suggested implementation of the proposed regulations would result in unnecessary duplication of effort by lessees. In keeping with Departmental policy, every effort was made to eliminate duplicative paperwork, reduce the volume of material submitted, and simplify the review procedures as fully as possible. Our review of the proposed rule identified no instance of significant duplication. When a lessee is required to submit information or data already in the possession of the Survey office that is to review the plan and accompanying Environmental Report, the lessee shall incorporate that information or data into the plan or report by appropriate reference identifying the documents and page numbers where the specific information or data will be found in the records of the Survey.

(2) Need for regulatory analysis. Several respondents suggested that implementation of the proposed regulations would have a significant impact on the Nation's economy and the oil and gas industry. They recommended the preparation of a regulatory analysis pursuant to Executive Order 12044. Prior to the publication of the modifications of 30 CFR 250.34 the Survey prepared a Negative Declaration and Regulatory Analysis. The "negative declaration" was based upon examination of the criteria established by the Department of the Interior (43 CFR Part 14) to determine whether the proposed regulations constituted a significant regulatory action requiring preparation of a regulatory analysis under Executive Order 12044. The examination indicated that an analysis was unnecessary based upon the following considerations: (1) The proposed changes were being made to existing regulations and did not mark a fundamental departure from established practices and procedures; (2) the proposed changes were in response to specific statutory requirements; and (3) the proposed changes should decrease the financial burden borne by lessees operating in the western Gulf of Mexico by eliminating the requirement that Environmental Reports be submitted with exploration plans or development and production plans, unless information contained in an Environmental Report is needed by a State to make a coastal zone consistency determination.

A review of that determination and the comments submitted by respondents failed to develop any basis or criteria which demonstrated any error in the previous negative determination or to justify a change in that determination.

(3) Need for Environmental Impact Statement. Several respondents indicated that implementation of the revised regulations would constitute a major Federal action significantly affecting the quality of the human environment, and that preparation of a detailed environmental impact statement (EIS) is required for compliance with section 102(2)(C) of the National Environmental Policy Act. Prior to the publication of the proposed modifications of 30 CFR 250.34, the Survey prepared a Negative Declaration and Environmental Assessment. The "negative declaration" was based upon the fact that the proposed regulations are specifically designed to, among other things, assure the protection of the marine, coastal, and human environments. The proposed regulations recognize that exploration activities and development and production activities may significantly affect the environment and provide for the evaluation of the effects of those activities. In those instances where significant impacts adversely affecting the marine, coastal, and human environments are identified, EIS's will be prepared in accordance with section 102(2)(C) of the National Environmental Policy Act.

(4) Identity of official to administer regulations. Several respondents expressed concern over the designation of the Director of the Geological Survey as the responsible administering official in 30 CFR 250.34. Current regulations identify the Supervisor as the official responsible for administering the regulations in 30 CFR 250.34. Respondents indicated that the proposed change would tend to create delays and confusion, and would disrupt the present system which has worked well for many years. We have not adopted the suggestion to designate the Supervisor as the USGS official administering these regulations. However, the change incorporated into these regulations will not appreciably alter present practices and procedures under which the Area Oil and Gas Supervisors and District Supervisors administer the provisions of 30 CFR Part 250, including § 250.34. Most of the authorities previously delegated to the Supervisor through the regulations will be delegated to the Supervisor or comparable officer through a Delegation of Authority from the Director. This approach anticipates a pending reorganization of the Conservation Division which will modify the organizational structure of offices at the Area and District levels.

(5) Effective date of rule. One respondent

recommended that it be made clear that exploration plans and development and production plans submitted after the effective date of these regulations will be subject to the requirements of these regulations. This respondent also questioned when the revised regulations will become effective. The review and processing of exploration plans and development and production plans submitted after the effective date of these regulations will be governed by the applicable provisions of these regulations. The effective date of these regulations will be the 91st day following their publication in the Federal Register as final rule.

(6) *Environmental reports*. Several respondents took exception to the decision to continue requiring the submission of Environmental Reports in support of exploration plans and development and production plans. Some questioned the Department's legal authority to require the reports, and many complained that the information contained in a lease sale EIS is sufficient to determine the environmental impact of activities covered in plans. Finally, some pointed out that the information required is so detailed, particularly for development and production plans, that the preparation of Environmental Reports is tantamount to preparing an EIS. The Department believes that it has ample authority to require the submission of Environmental Reports and that this authority predates enactment of the OCS Lands Act Amendments of 1978. The specific requirement that a lessee submit an Environmental Report in support of proposed exploration plans and development and production plans has been a part of the regulations governing oil and gas operations in the OCS since January 27,1978. Similar information has been required of lessees on a case-by-case basis since the earliest oil and gas operations were regulated on the OCS. The information contained in Environmental Reports is needed to carry out the purposes of the Act and the specific requirements of sections 11(c)(1), 25(a)(2), and 25(h)(1) of the Act. Although impacts of exploration activities may be covered, to a degree, in the corresponding lease sale EIS, the information and data contained in the corresponding lease sale EIS are not generally sufficiently site-specific to provide adequate environmental information and data for the review of exploration or development and production plans. To the extent that the information and data in the corresponding lease sale EIS are sufficient, the governing provisions of the regulations make it clear that the lessee is to incorporate that information and data in the Environmental Report by appropriate reference and to avoid unnecessary detail and length. The intention is that information be sufficiently detailed to permit the evaluation of the impacts of the proposed activities, considering operating conditions in the lease area as well as past experience. It also recognizes the Department's agreement with the Office of Coastal Zone Management to require specific information in order that coastal States with approved coastal zone management programs will have access to sufficient information for the coastal zone consistency Reviews required under the Coastal Zone Management Act.

(7) *Gulf of Mexico exemption*. Treatment in the proposed regulations of the exemption for certain Gulf of Mexico leases created in section 25(a)(1) of the Act has raised several questions.

First, some respondents requested clarification of those parts of the Gulf subject to the exemption. A number of commenters accurately pointed out that the proposed regulations are not precise in identifying those parts of the OCS that are adjacent to Florida. One respondent recommended limiting this area to the tracts which are continguous with the seaward boundary of Florida, while most urged the adoption of the area identified in the June 7, 1978, *Federal Register* (43 FR 24711). In order to correct the ambiguity of the proposed regulatory language, the regulations have been modified to indicate that the Director will determine which OCS areas of the Gulf of Mexico are adjacent to the State of Florida. In making these determinations the Director will use, if they are available, the projected boundaries of each State established by the National Oceanic and Atmospheric Administration.

The terms "eastern Gulf of Mexico" and "western Gulf of Mexico" will be used to differentiate between the portions of the Gulf subject to the exemption. Definitions will be added to 30 CFR 250.2 which indicate that, as used in § 250.34 "western Gulf of Mexico" means all OCS areas of the Gulf of Mexico except those deemed by the Director to be adjacent to the State of Florida and "eastern Gulf of Mexico" means all OCS areas of the Gulf of Mexico deemed by the Director to be adjacent to the State of Florida.

A second issue which arose concerned the extent of the exemption created for western Gulf of Mexico leases. Several respondents argued that leases in the western Gulf of Mexico are exempt, under section 25(a)(1) of the Act, from the requirement that development and production plans must be submitted to and approved by the Director before the commencement of operations. The Department does not agree with this interpretation of section 25 (a)(1) of the Act.

After reviewing the Act, the Conference Committee Report, and the legislative history, the Department is convinced that section 25(a) (1) of the Act does not bar the Secretary from continuing to require the submission of development and production plans for leases in the western Gulf of Mexico. We have interpreted this section to mean that the procedures for handling of development plans and requirements for plan content, while mandatory for all other areas, do not necessarily apply to development and production activities in the western Gulf of Mexico. The purpose of the Gulf of Mexico exemption is to insure that onerous and unnecessary environmental reporting requirements and burdensome procedures are not imposed on lessees in this area of the Gulf where oil and gas activities have occurred for years.

The information and data contained in development and production plans are as essential for the proper management of development and production activities in the Gulf of Mexico as they are for the proper management of these activities on leases in frontier areas of the OCS. In addition, these plans are necessary for the Secretary of the Interior to carry out a multitude of functions mandated by the Act, including:

(1) Insuring that lessees exploring, developing, and producing OCS leases issued after September 18, 1978, use the best available and safest technologies [see: section 21 (b)];

(2) Preventing waste and insuring the conservation of the natural resources of the OCS [see: section 5(a)];

(3) Insuring the prompt and efficient exploration and development of the OCS [see: section 5(a)(7)];

(4) Enforcing in cooperation with other Federal Agencies, all health, safety, and environmental laws and regulations on the OCS [see: section 5(a)];

(5) Insuring compliance with any rate of production requirements imposed by the Department of Energy [see: section 5(g)];

(6) Exercising the authority to grant suspensions of operations or suspensions of production [see: section 5(a)];

(7) Exercising the authority to authority to authorize or require the unitization of leases [see: section 5(a)(4)]; and

(8) Insuring coordination and consultation with affected States and local governments [see: section 19].

If the information required to carry out these functions is not obtained through development and production plans, then it would have to be obtained through some other means. The Department believes that the most efficient means of obtaining the information is through the plans. The regulations have been modified, however, to allow the Director to limit the amount of information required in development and production plans to that information that is necessary to assure conformance with the Act, other laws, applicable regulations, and lease provisions.

In the proposed rule the Department exempted leases in the western Gulf of Mexico from the requirement that an Environmental Report be submitted with the development and production plan, unless an affected State with an approved coastal zone management program indicates a need for the report to make a coastal zone consistency determination. We have retained this provision. However, we added new paragraphs § § 250.34-3(a)(1)(iii) and 250.34-3(b)(1)(iv) which specifically allow the Director, after consultation with the Office of Coastal Zone Management and the affected State, to limit the information that will be required to be included in Environmental Reports (Exploration and Development/Production) to that information that is necessary for a State to make a coastal zone consistency determination.

Several respondents recommended that the treatment which section 25(a)(1) of the Act provides for development and production plans be extended to exploration plans. Although section 11 of the Act contains no language to support any special treatment for exploration plans in the western Gulf of Mexico, we feel that it makes sense to extend the exemption and limitations that apply to Environmental Reports for development and production plans to Environmental Reports for exploration plans. Exploration, development, and production activities have been conducted for more than 30 years in the Gulf of Mexico, and enough is known about the mature parts of the Gulf area for us to be more selective concerning the environmental information required from lessees. For this reason, we also rejected the suggestion of one respondent that there should be no special exemption from the requirement to submit Environmental Reports with plans in the western Gulf of Mexico.

(8) Identification of affected States. Several respondents wanted the regulations to include a definition of "affected State." The Department has not included a definition of "affected State" in this rule (30 CFR 250.34) because the definition of the terms used in 30 CFR Part 250 are contained in 30 CFR 250.2. The term "affected State" will be defined in 30 CFR 250.2(a).

(9) Early consultation with State and local government agencies. The suggestion that State and local government agencies receive proposed exploration plans and development and production plans before they are "deemed submitted" by the Survey has been rejected. Only complete plans will be available to State and local governments. By submitting one copy of a proposed plan and the accompanying Environmental Report to the Survey for a "completeness" review, the lessee will be protected against the submission and replacement of multiple copies of a deficient plan.

Several respondents asserted that the Department has no authority to take 10 working days for exploration plans and 20 working days for development and production plans for complete-

pages tightly bound

ness reviews. The Department disagrees with this interpretation of the statute and believes that the incorporation of this procedure will actually speed the review of plans. In order to meet the tight time periods accorded in the Act for the review of plans, it is imperative that only complete plans (i.e., plans containing all of the information required) enter the review process.

The recommendation by one respondent that OCS operators be required to consult with State and local representatives and appropriate Federal officials before making a formal application for approval of an exploration plan or a development and production plan has not been adopted. However, operators are encouraged to participate in preapplication reviews. Informal conferences are believed to be helpful to all concerned.

(10) Formal consultation with affected States during the review of exploration plans. The suggestion that the regulations specify a formal consultation procedure with affected States during review of exploration plans has not been adopted, however, any affected State may submit timely comments. The Department recognizes that the short timeframe mandated for the Federal review of exploration plans (30 days) makes it difficult for States to participate in the review process. Section 11 of the Act is silent on the role of affected States without approved coastal zone management programs in the review of plans; however, we believe that it is consistent with sections 102 and 202 of the Act to afford affected States an opportunity to receive and review plans in a timely fashion. In this regard, a provision has been included that requires exploration plans to be transmitted to affected States within 2 working days of the date the plans are "deemed submitted" by the Director. Recipients are encouraged to review plans and submit their comments on the plans as expeditiously as possible. Comments submitted in a timely fashion will be considered by the Survey.

Several respondents complained that the timeframes for review of plans, especially review of exploration plans, are not adequate to permit State and local agencies to review and comment on proposed plans. The Department cannot alter these timeframes because they are prescribed by the provisions of the Act.

(11) Impact of the preparation of an Environmental Impact Statement on the timeframe allotted for coastal zone consistency review. One respondent recommended that, in instances when the Director determines that approval of a development and production plan is a major Federal action requiring the preparation of an EIS, the 6-month time period for a State's consistency review of a plan should not commence until the final EIS has been published. The Department rejects this recommendation. It is clear from the provisions of section 25 of the Act that a State's coastal zone consistency review is independent of the National Environmental Policy Act review procedures, and the coastal zone consistency review should be completed within the timeframe specified in the Act and the implementing regulations. The Environmental Report is designed to provide all the information needed for the consistency review. To adopt the suggested procedure would result in a delay that is contrary to the intent of Congress.

(12) Consistency concurrence. Several commenters pointed out that the provisions of § 250.34-1(b)(4) and 2(c)(3)(i) of the proposed rules, which requested that the Governor of an affected State with an approved coastal zone management program, notify the lessee and the Director, at the earliest possible time, if the Governor determines that the activities described in detail in a plan will have no significant impacts on land and water uses in the State's coastal zone, are in conflict with provisions of 15 CFR 930.79. We agree and have deleted the provisions.

Also, several commenters pointed out that § 250.34-2(g)(1)(iii) of the proposed rules incorrectly implies that the Director, rather than the States with approved coastal zone management programs, make the consistency determination before approving a development and production plan. We have clarified this situation by dropping, in the final rules, the specific reference to the Coastal Zone Management Act of 1972 in the list of plan approval criteria.

Finally, some commenters asked whether § 250.34-1(h) of the proposed regulations, which states that a lessee "may" revise a plan to accommodate a State's objection(s) raised during the consistency review process and resubmit the plan to the Director and the State for review, conflicts with 15 CFR 930.83, which states that a lessee "shall" revise and resubmit the plan. We agree that there is a conflict in the language contained in the proposed language and have decided to change it to conform to the language of 15 CFR 930.83.

(13) Impact of air quality regulations. One respondent argued that the Secretary may not approve a development and production plan until regulations implementing section 5(a)(8) of the Act are in effect. The Department finds no basis for this assertion. Proposed regulations to implement section 5(a)(8) of the Act were published in the Federal Register on May 10, 1979 (44 FR 27449). It is expected that final rules will be published later this year. The requirements of those final rules will be applicable to exploration, development, and production activities in the OCS. There is no language in the Act to suggest that Congress intended a moratorium or a delay in the exploration for and development of oil and gas

from the OCS until these regulations are promulgated. A primary purpose of the Act is to insure that the extent of oil and natural gas resources of the OCS is assessed at the earliest practicable time.

(14) Consistency of Federal regulations with State regulations. Several respondents pointed out a conflict between the requirements of the proposed § 250.34 regulations and the requirements of regulations of the California Coastal Commission regarding the submission of exploration plans. The § 250.34 regulations provide for the distribution of plans to affected States after they are "deemed submitted." The California Coastal Commission regulations require the advance submission (15 days) of plans for exploration before the Commission begins its coastal zone consistency review process. The Federal regulations governing coastal zone consistency review indicate that the State's coastal zone consistency review process starts with the receipt of a plan from the Secretary of the Interior or the delegate of the Secretary. Personnel of the Department of the Interior have discussed this situation with personnel of the California Coastal Commission. Currently the Commission only requires the advance submission of a general statement of a lessee's exploration intentions so that the Commission may prepare for the receipt of the actual exploration plan and accompanying Environmental Report from the Survey. There is no conflict between this requirement of the Commission's regulations and regulations in this section. Given the expeditious consideration that exploration plans have received by the California Coastal Commission, this procedure seems to be working well.

(15) Public notice of the submission of development and production plans. The recommendation of one respondent that procedures be adopted which require the publication of a notice announcing the submission of development and production plans has been adopted. Upon receipt of a development and production plan, a notice announcing that fact will be published in the Federal Register. Where there is a high degree of public interest in the proposed plan, the Director may also publish a notice in local newspapers.

(16) Mailing list of interested citizens. One respondent suggested that the Director should keep a mailing list of citizens who have expressed interest in receiving copies of plans. Although we have not adopted this suggestion within the body of the regulations. Survey officers that receive and distribute plans are expected to maintain a mailing list of persons interested in knowing when plans have been submitted. In this way, those citizens who wish to be made aware of the information contained in plans can learn of the availability of plans and how the plans can be reviewed.

A related suggestion by one respondent to incorporate language indicating that the Director will consider timely recommendations of the public that are submitted in connection with development and production plans has been adopted.

(17) Area covered by exploration plan and development and production plan. Several respondents suggested modifying language to clarify the area to be covered by an exploration plan. The language of § 250.34-1(a)(1) has been modified to make it clear that an exploration plan may cover more than one leasehold. When an exploration plan covers more than one leasehold, it must represent a comprehensive exploratory program for all of the area included in the leases covered by the plan.

The recommendation of one respondent that lessees be required to cover as many leases as possible when submitting a development and production plan has not been adopted. These regulations allow lessees to include operations on more than one lease in their development and production plans. It should also be noted that other regulations in 30 CFR Part 250 contain provisions which govern the unitization of OCS oil and gas leases. The provisions of those regulations and the provisions of OCS oil and gas leases provide adequate authority to require the submission of development and production plans covering more than one lease.

Several respondents argued that the proposed regulations required too much detail concerning the location of exploratory wells. They recommended using the language of section 11 (c)(3)(C) of the Act, which refers to "the general location of each well," as opposed to the language of the proposed regulations, which refers to "the approximate location" of each well. We have rejected this recommendation because information on well location must be as specific as possible to adequately assess the impacts of the proposed activity, and to assist States with approved coastal zone management programs in the consistency review process.

(18) Deadline for submission of exploration plans. Numerous comments were received regarding the provisions in the proposed regulations which would require lessees to submit exploration plans within a specific timeframe [§ 250.34-1(a)(4)]. Those commenters contended that the provisions should be dropped because they go beyond the authority of the Secretary of the Interior and because the proposed provisions were not sufficiently flexible to reflect the sequential nature of exploration activities on the OCS. The provisions of the proposed regulations in § 250.34-1(a)(4) which would require lessees to submit exploration plans within a specific timeframe were designed to implement section 5(a)(7) of the Act, requiring the Secretary to issue regulations for the prompt and efficient exploration and development of a lease area. After considering the comments the Department decided that a more

flexible approach could be adopted and still meet the mandate of the Act. Therefore, the provisions requiring the submission of an exploration plan within a specific timeframe have been modified to allow the lessee of a lease issued for an initial period of five years to submit, before the end of the second lease year, either an exploration plan or a general statement of exploration intentions. For leases for an initial period of more than five years, the lessee shall submit either an exploration plan or a general statement of exploration intentions within a period of time specified at the time the tracts are offered for leasing. These provisions will only be applicable to leases issued after the effective date of these regulations.

(19) List of required Federal licenses and permits. Some respondents suggested that an exploration plan and a development plan should include a list of all the Federal licenses and permits required to implement the proposed plan. This suggestion has not been adopted. Such a listing is not necessary to complete the documents, data, and information needed before an exploration plan or a development and production plan can be approved. However, the Department supports the Office of Coastal Zone Management in its efforts to encourage lessees to obtain a State's coastal zone consistency review of all interrelated licenses and permits at one time.

(20) Cost of additional surveys. Many respondents questioned the provisions of paragraph 250.34-1(k) and 250.34-2(n) which spell out the Director's authority to require a lessee to conduct geological, geophysical, or other surveys that the Director determines to be necessary for the evaluation of activities to be carried out under a proposed or approved exploration plan or proposed or approved development and production plan. The Department does not believe that it is the intent of Congress that the Department should pay for surveys and reports required to evaluate the exploration, development, and production activities which the lessee proposes to conduct on the leasehold.

(21) Environmental assessment. The Department did not adopt the suggestion that a provision be added requiring the Director to provide the Governor of each affected State with a copy of the environmental assessment prior to the approval of a plan. Environmental reviews are conducted as part of the decision-making process for exploration plans and development and production plans. Environmental assessments generally are not complete until the end of the time allowed for making the decision to approve or disapprove a plan. However, copies of environmental assessments will be provided to those affected States that advise the Survey of their desire to receive them.

(22) Proprietary and confidential information. One respondent suggested that lessees be required to provide a general statement describing the subject matter of confidential and proprietary data and information deleted from exploration plans and from development and production plans. The purpose of this statement would be to give those receiving or reviewing the plans a general idea of the nature of the information covered by the deleted material. This suggestion has been adopted.

(23) General statement of development and production intentions. Varying comments were received on the requirement to submit a general statement of development and production intentions with exploration plans. Some respondents believed that the provision should indicate that such a statement will be required in all cases. Other respondents felt that the provision should be deleted in its entirety. The discretionary authority to require such a statement is provided for in section 11(c)(4) of the Act, and has been retained in the final regulations.

(24) Application for permit to drill. The suggestion of one respondent that these regulations require the Director to transmit a copy of a lessee's application for a permit to drill to affected States for review has not been adopted. The drilling operations covered by these applications are covered by exploration plans or development and production plans which have been reviewed and approved. They are not subject to review under either section 19 of the Act or the Coastal Zone Management Act. However, in order to address the respondent's concern for followup information on activities conducted under approved plans, specific language has been added to the regulations which provides for the transmission to the affected States of copies of each approved application for permit to drill.

(25) Emergency situations. Some respondents asked that the "emergency" conditions under which emergency measures might be approved or directed be more clearly defined. Unfortunately, it is not possible to list all the possible emergency situations which may develop. Any attempt to define "emergency" may limit the Department's ability to authorize or require immediate response to unforeseen situations where quick action is necessary. Therefore, the language of the proposed regulations has been retained.

(26) Conditional approval of exploration plan. Several respondents suggested the elimination of the reference to "conditional" approvals for exploration plans. This suggestion has been adopted. Under the provisions of the regulations published in this notice, an exploration plan may be approved prior to receipt of the State's concurrence with the lessee's coastal zone consistency certificate. However, no license or permit called for under

an approved exploration plan can be granted until the State's concurrence in the lessee's coastal zone consistency certificate is received or is conclusively presumed; or the Secretary of Commerce takes action under the Coastal Zone Management Act.

(27) Review of activities conducted under approved plans. Some commenters recommended deletion of the requirement that activities conducted under approved plans be periodically reviewed by the Director. Others suggested expansion of the provisions to prescribe additional criteria for triggering the review of activities being conducted under approved plans. The Department has rejected these suggestions. Operational experience gained under the current regulations, which contain similar language, indicates that a general statement, like the one included in the proposed regulations, is sufficient to recognize that such reviews are to be expected. The language also provides regulatory authority for those reviews that become necessary for proper implementation of the Act.

SECTION-BY-SECTION DISCUSSION

The discussion in the preceding section was intended to give the reader an overview of the major comments that were received, together with a brief statement of the reasons for accepting or rejecting the suggestions that were offered. In this section, specific changes made in the proposed rules will be described.

§ 250.34-1 Exploration plan.

The first sentence of § 250.34-1(a)(1) has been modified to show clearly that the commencement and continued conduct of exploration activities must be in accordance with the approved exploration plan. The sentence now reads: "No exploration activities, except for preliminary activities, may be commenced or conducted on any leased area except in accordance with an exploration plan approved by the Director."

The third sentence of § 250.34-1(a)(1) has been modified by omitting the phrase "whichever is less" because it added unnecessary confusion to this section of the regulations. Also, the regulations continue to allow the lessee to conduct "preliminary activities." These activities are necessary in order for lessees to gather sufficient information to prepare an initial exploration plan. Without some knowledge of the area's geology, it would be difficult or impossible to prepare a comprehensive exploration plan, including locations for proposed wells for the area. This system conforms with past practice and it has been shown that it does not result in any appreciable adverse environmental impacts.

The fifth sentence of § 250.34-1(a)(1) has been modified to recognize that an exploration plan shall be based upon all available relevant information and may cover more than one leasehold. It is the Department's intention that an exploration plan provide for a comprehensive exploration program for all of the area covered by the lease(s) which the lessee(s) chooses to cover by the plan. The Department expects the lessee to identify all potential hydrocarbon accumulations and the wells that the lessee intends to drill to explore the accumulations. The sentence now reads: "An exploration plan shall be based upon all available relevant information and shall identify, to the maximum extent possible, all potential hydrocarbon accumulations and the wells that the lessee proposes to drill to evaluate the accumulations in the entire area included within the lease(s) covered by the exploration plan."

Section 250.34-1(a)(1)(ii) has been modified to emphasize that exploration plans must include oil spill containment and cleanup plans.

The words "of each directionally drilled well" have been deleted from § 250.34-1(a)(1)(iv). This change reflects our belief that the reviewers of exploration plans are interested in knowing the proposed surface and projected bottom hole locations of all the wells proposed to be drilled under the plan regardless of whether they are "directionally drilled."

The proposed regulations included language in § 250.34-1(a)(2)(i) which indicated that an Environmental Report would be considered part of the exploration plan and would accompany it through all review processes. Because "all review processes" ultimately include plan approval or disapproval, and because the Survey does not approve or disapprove an Environmental Report but instead uses it for the review of the impacts of proposed activities, this section has been modified to make it clear that the plan and Environmental Report are separate documents. An Environmental Report will, however, continue to accompany the related plan through all review processes.

Section 250.34-1(a)(2)(ii) has been modified to indicate that the only time an Environmental Report will be required in the western Gulf of Mexico is when the proposed exploration activities would affect a land or water use in the coastal zone of a State with an approved coastal zone management plan. The Director retains the right, however, to request specific environmental information to make the findings required under applicable law, including but not limited to the Act, and the Coastal Zone Management Act.

Sections 250.34-1(a)(3) and (4) in the proposed rule have been dropped and a new § 250.34-1(a)(3) has been added which states that, for all leases for an initial period of five years issued after the effective date of these regulations, the lessee shall submit before the end of the second lease year either an exploration plan or a general statement of exploration intentions. A new sentence has been added to indicate that for leases with an initial period of more than five years, the lessee shall submit either an exploration plan or a general statement of exploration intentions within a period of time specified at the time the tracts are offered for leasing.

Section 250.34-1(a)(5) has been modified to include the requirement that lessees provide a general statement describing the subject matter of confidential and proprietary data and information that has been deleted from the copies of an exploration plan that are provided for distribution to States and are made available to local government executives, and other interested parties.

Section 250.34-1(a)(6) has been modified to indicate that an exploration plan and its accompanying Environmental Report will not be deemed submitted until the Director has sufficient copies of the documents for the prescribed distribution. Language has also been incorporated that makes it clear that an exploration plan must include the certificate of consistency called for in 15 CFR Part 930 in order for the plan to be considered complete.

Section 250.34-1(b)(1) has been modified to indicate that an exploration plan and its related Environmental Report will be transmitted to the recipients listed in the paragraph "within 2 working days" after the date the plan is "deemed submitted."

Section 250.34-1(b)(3) has been modified by the substitution of a new § 250.34-1(b)(3) which reads: "(3) When it is determined that the activities proposed in an exploration plan will significantly affect any land use or water use in the coastal zone of a State with a coastal zone management program approved pursuant to section 306 of the Coastal Zone Management Act, the plan will be processed in accordance with the regulations in this section and the regulations governing Federal Coastal Zone Management Consistency Procedures (15 CFR Part 930)."

Section 250.34-1(c) has been modified to refer to the environmental review process outlined in § 250.34-4.

Section 250.34-1(d) has been modified to indicate that the Director will consider all written comments that are timely received from the Governor of an affected State.

Section 250.34-1(e)(2)(ii) has been changed to make it clear that the lessee is responsible for making whatever modifications are necessary to gain approval of an exploration plan.

Section 250.34-1(j)(1) has been modified to indicate that the Director will periodically review activities being conducted under an approved exploration plan. Those activities, coupled with additions to and refinements of existing information and data will serve as the basis for the Director's decision to order a revision of an approved plan.

Section 250.34-1(j)(2) has been modified to indicate that plan revisions which call for additional permits will be subject to coastal zone consistency review. Language has also been added to indicate that the recipients of approved plans will be provided information copies of all revisions of and updates to approved plans.

§ 250.34-2 Development and Production Plans.

The first sentence of § 250.34-2(a)(1) has been modified to read: "(a)(1) No development or production activities may be commenced or conducted on any leased area, except in accordance with a plan of development and production approved by the Director." The changes in this section are designed to make it conform to the language of § 250.34-1(a)(1) and to show clearly that the commencement and continued conduct of development and production activities must be in accordance with an approved development and production plan.

Section 250.34-2(a)(1)(ii) has been modified to emphasize that a development and production plan must include oil spill containment and cleanup plans.

The words "of each directionally drilled well" have been deleted from § 250.34-2(a)(1)(iii). This change reflects our belief that the reviewers of development and production plans are interested in knowing the proposed surface and projected bottom hole locations of all wells proposed to be drilled under the plan regardless of whether they are "directionally drilled."

Section 250.34-2(a)(1)(iv) has been modified by inserting the word "relevant" between "available" and "geological."

Section 250.34-2(a)(2) has been reorganized into subparagraphs (2) and (3). The new § 250.34-2(a)(2) provides that the Director may limit the information that will be required to be included in a development and production plan for leases in the western Gulf of Mexico.

The new § 250.34-2(a)(3)(i) has been modified to make it clear that the Environmental Reports are not considered part of development and production plans. Also, § 250.34-2(a)(3)(ii) has been modified to indicate that the only time that an Environmental Report will be required in the western Gulf of Mexico is when the proposed development and production activities would affect a land or water use in the coastal zone of a State with an approved coastal zone management program. The Director also retains the right to request specific environmental information to make needed findings under applicable law, including the Act, the National Environmental Policy Act, and the Coastal Zone Management Act.

Section 250.34-2(a)(5) has been modified to include the requirement that lessees provide a general statement describing the subject matter of confidential and proprietary information and data that has been deleted from the copies of a development and production plan that are provided for distribution to States and local government executives and are to be made available to other interested parties.

Section 250.34-2(a)(6) has been modified to indicate that a development and production plan and its accompanying Environmental Report will not be deemed submitted until the Director has sufficient copies of the documents for the prescribed distribution. Language has also been incorporated that makes it clear that a development and production plan must include the certificate of coastal zone consistency called for in 15 CFR Part 930 in order for the plan to be considered complete.

Section 250.34-2(b)(1) has been modified to reflect the changes made in § 250.34-2(a)(6) and to indicate that the Director shall notify the public of the availability of plans and Environmental Reports for review.

Section 250.34-2(c)(3)(i) has been modified to indicate that the Director will consider all comments that are timely received.

Section 250.34-2(d) has been modified to refer to the environmental review process outlined in § 250.34-4.

Section 250.34-2(g)(2)(ii) has been changed to make it clear that the lessee is responsible for making whatever modifications are needed to gain approval for a plan.

The provisions of § 250.34-2(g)(2)(iii)(A) have been revised to recognize that a State's concurrence with a coastal zone consistency certification may be conclusively presumed after 3 months, unless the State indicates that it needs additional time (up to 3 months) to complete its review.

Section 250.34-2(i) has been revised to recognize the authority of the Secretary of Commerce to make a finding under section 307(c)(3)(B)(iii) of the Coastal Zone Management Act.

Section 250.34-2(l) has been modified to indicate that the Director will periodically review activities being conducted under an approved development and production plan. Those activities, coupled with additions to and refinements of existing information and data, will serve as the basis for the Director's decision to order a revision to an approved plan.

Section 250.34-2(l) has been modified to indicate that plan revisions which call for additional permits will be subject to coastal zone consistency review. Language has also been added to indicate that the recipients of approved development and production plans will be provided information copies of revisions of and updates to approved plans.

§ 250.34-3 Environmental Report.

Sections 250.34-3(a) and (b) have been slightly modified to clarify the nature and scope of the information that is to be included in an Environmental Report (Exploration) and (Development/Production). The principal changes are designed to make it clear that the Department does not want the lessee to duplicate information or data which is already in the possession of or readily available to the Survey office that will process the plan and review the report. The lessee is to incorporate that information or data into an Environmental Report (Exploration or Development/Production) by reference. Lessees are also required to provide information on how to obtain copies incorporated by reference.

These subsections have also been expanded to include special provisions for leases in the western Gulf of Mexico. Under these provisions the Director may, after consultation with the Office of Coastal Zone Management and the affected State(s), limit the amount of information that is required to be included in an Environmental Report, if a report is needed at all, to the information needed to make coastal zone consistency determinations.

Section 250.34-3(a)(i)(1)(G) has been restructured to state more clearly the environmental and socioeconomic considerations to be addressed in the lessee's Environmental Report. The restructuring of this paragraph has not resulted in any addition to the lessee's reporting burden.

The provisions of § 250.34-3(b)(1)(i)(A)(4) have been expanded to include the specific requirement that lessees identify the means of transportation to be used to bring wastes to shore, the disposal methods to be utilized, and the location of onshore waste disposal or treatment facilities for waste generated on the OCS that requires onshore disposal. Finally, all references to information relating to air quality have been deleted. The Department is currently completing work on regulations to implement section 5(a)(8) of the Act and envisions reincorporating air quality information requirements into 30 CFR 250.34-3 as a new subsection.

§ 250.34-4 Compliance with NEPA.

Section 250.34-4 has not been revised to include specific criteria to indicate the circumstances under which the Director will determine that approval of a development and production plan constitutes a major Federal action requiring the preparation of an EIS. Efforts to establish criteria would unnecessarily limit the discretionary authority granted the Secretary of the Interior under section 25(e)(1) of the Act. We recognize, however, the desirability of having these documents give as comprehensive an assessment of the environmental impact of development and production activities in a given areas as is possible.

AUTHORS

Thomas McCloskey, Office of the Assistant Secretary--Energy and Minerals, U.S. Department of the Interior (202/343-4457); Theresa Hooks, Office of the Solicitor, U.S. Department of the Interior (202/343-4325); and Gerald Rhodes, Geological Survey, U.S. Department of the Interior (703/860-7531).

ENVIRONMENTAL IMPACT AND REGULATORY ANALYSIS STATEMENTS

The Department of the Interior has determined that this revision of the regulations in 30 CFR 250.34 does not constitute a major Federal action significantly affecting the quality of the human environment and, therefore, preparation of an Environmental Impact Statement is not required. The Department has also determined that this notice of final rule is not a significant action and does not require the preparation of a regulatory analysis under Executive Order 12044.

JOAN M. DAVENPORT,
Assistant Secretary of the Interior

SEPTEMBER 11, 1979

3. Preamble, 30 CFR 250.2, Definitions; 250.34-3, Environmental Reports; and 250.57, Air Quality; 45 FR 15128, March 7, 1980.

DEPARTMENT OF THE INTERIOR

Geological Survey

30 CFR Part 250

Oil and Gas and Sulphur Operations in the Outer Continental Shelf

AGENCY: U.S. Geological Survey, Department of the Interior.

ACTION: Final rule.

SUMMARY: This rule establishes a regulatory program to implement Section 5(a)(8) of the Outer Continental Shelf (OCS) Lands Act Amendments of 1978, Pub. L. 95-372 (herein referred to as the "Act"), concerning the regulation of air emissions from oil and gas operations on the OCS. The regulations revise 30 CFR 250.2 and 250.34 and create a new section 30 CFR 250.57.

DATE: This rule shall become effective on June 2, 1980.

ADDRESSES: A copy of this final rule may be obtained from the following offices of the Geological Survey:

Chief, Conservation Division, U. S. Geological Survey, National Center; Mail Stop 600, Reston, Virginia 22092.

Conservation Manager--Eastern Region, U.S. Geological Survey, 1725 K Street, N.W., Suite 204, Washington, D.C. 20006.

Conservation Manager—Gulf of Mexico OCS Region, U.S. Geological Survey, 336 Imperial Office Building, P.O. Box 7944, Metairie, Louisiana 70010.

Conservation Manager--Pacific OCS Region, U.S. Geological Survey, 1340 West Sixth Street, Room 160, Los Angeles, California 90017.

Conservation Manager--Alaska Region, U.S. Geological Survey, 800 "A" Street, Suite 109, Anchorage, Alaska 99501.

FOR FURTHER INFORMATION CONTACT:

John Goll, U.S. Geological Survey, National Center Mail Stop 600, Reston, Virginia 22092 (703) 860-7136.

AUTHORS: Thomas McCloskey, Office of the Assistant Secretary--Energy and Minerals, Department of the Interior, Theresa Hooks, Office of the Solicitor, Department of the Interior, R. A. Karam, Office of OCS Program Coordination, Office of Assistant Secretary--Policy, Budget and Administration, Department of the Interior, John Goll, U.S. Geological Survey, Department of the Interior.

SUPPLEMENTARY INFORMATION:

BACKGROUND

The Act requires that the Secretary of the Interior prescribe regulations with provisions for compliance with the national ambient air quality standards pursuant to the Clean Air Act (42 U.S.C. 7401 et seq.), to the extent that activities authorized under the Act significantly affect the air quality of any State (Section 5(a)(8), 43 U.S.C. 1334). By Notice of December 28, 1978, (43 FR 60612) public comments were requested to assist the Department of the Interior in the identification and selection of a regulatory program to control air emissions from activities authorized under the Act which significantly affect onshore air quality. On May 10, 1979, proposed regulations on this subject were published in the Federal Register (44 FR 27449).

COMMENTS

Fifty-five sets of comments and recommendations were submitted in response to the invitation contained in the notice of proposed rule. The comments and recommendations varied widely in nature, scope, and content. Several of the commenters included studies and analyses as part of their submission. The comments represented the views of 6 public interest and environmental groups, 20 Federal, State, and local government agencies, and 29 industry and trade organizations.

PUBLIC HEARINGS

Oral testimony relating to the proposed regulations was taken at public hearings held in Los Angeles, California on June 7, 1979, New Orleans, Louisiana on June 12, 1979, and Washington, D.C. on June 14, 1979.

DISCUSSION OF MAJOR ISSUES

1. Need for Regulations. Several commenters asserted that the promulgation of the air quality regulations is premature. They argued that no regulatory action should be taken until the Department makes a formal determination that OCS operations are having or could have significant effects on the air quality of an onshore area of a State.

The Department has rejected this argument. The procedures outlined in the final regulations are to be used to determine whether emissions from an OCS facility significantly affect an onshore area. The regulations are necessary to insure that all concerned are aware of these procedures and are advised as to how the Secretary intends to fulfill the statutory responsibilities related to the protection of onshore air quality. This approach is similar to that followed under other regulatory programs and is fully consistent with the Department's statutory mandate.

A number of commenters asserted that the regulations are excessively stringent and unnecessarily broad and complex. They argued that the regulations would delay and add unnecessary expense to the exploration for and development of OCS oil and gas resources and characterized the program as a clear case of overregulation that ignores Congressional intent and exceeds the statutory mandate. One commenter remarked that a decision to publish such complex regulations should be coupled with a commitment to establish a training program for industry. The Department believes that the regulations are reasonable, practical, and consistent with the statutory mandate. This preamble contains a detailed discussion of the regulations which explains the necessity and rationale for each regulatory requirement. Air quality considerations are complicated, particularly as they relate to the unique circumstances encountered on the OCS. However, every effort has been made to make the Department's OCS air quality regulations as clear and straightforward as possible.

Although a number of commenters expressed support for the overall regulatory framework and the adoption of significance levels and prevention of significant deterioration (PSD) increments from the Environmental Protection Agency (EPA), others argued that EPA standards and practices were inappropriate in the regulations. The Department has developed a regulatory framework which is similar, in many respects, to the one employed by EPA. The Department decided to follow EPA's program, to the maximum extent possible, because of that agency's air quality expertise. The Department's program differs in some respects, however, because the Department's mandate under the Act is different than EPA's mandate under the Clean Air Act and because offshore conditions differ from those encountered onshore. The Clean Air Act gives EPA the authority to regulate air pollution sources onshore. The Act, on the other hand, authorizes the Department to regulate OCS activities only if the emissions from the activities have significant effects on onshore air quality. Also, all OCS sources are external to the areas whose air quality they may affect, a situation not commonly encountered in EPA's regulatory program. Thus, the Department has used only those aspects of EPA's program that are adaptable to the offshore situation. In doing so, we have fulfilled the Congressional intent that the Department be "guided by the Clean Air Act, in consultation with the Environmental Protection Agency" in devising this air quality program.

One commenter requested that the final regulations explain the relationship of section 25(a)(1) of the Act to the air regulatory scheme. Section 25(a)(1) provides for the creation of a less burdensome regulatory program in the western Gulf of Mexico. Under regulations governing the submission and approval of exploration plans and development and production plans, (see 44 FR 53686, September 14, 1979) OCS leases in the western Gulf of Mexico will be treated differently from leases in other OCS areas. Environmental Reports, for example, will not be required unless an affected State has an approved coastal zone management plan. If a report is requested, the Director of the U.S. Geological Survey (GS) will allow a lessee to submit only that information the State indicates it needs to make its consistency determination. The different treatment accorded for western Gulf of Mexico leases does not, however, extend to air quality reporting and control requirements. Nothing in the language of the statute or the legislative history suggests that the provisions of Section 25(a)(1) of the Act exempt lessees from the air quality regulatory program. Section 5(a)(8) of the Act requires "compliance * * * to the extent that activities authorized under this Act significantly affect the air quality of any State." A lessee submitting a new or revised plan after June 2, 1980, will be required to submit the information needed to make the findings under § 250.57-1(d)-(i), and to take the necessary measures to control emissions regardless of whether an Environmental Report is required. Likewise, existing facilities in the Gulf of Mexico may be reviewed in the same manner as existing facilities in other parts of the OCS.

Finally, several commenters objected to the regulatory scheme because the lessee, instead of the Department, "controls" the information. These commenters criticized the "passive" role of the Department and asserted that the regulator, not the regulated, should be responsible for collecting and interpreting data and making decisions concerning the applicability of the regulations to OCS operations. We do not believe that this is an accurate characterization of the role of the Department in implementing these regulations. The regulations place initial responsibility for all information gathering on the lessee. However, the Director has clear authority to require supplementary information and to take whatever action is necessary to validate the information. Additionally, the GS will review and evaluate all information submitted by the lessee and will make all final decisions concerning the necessity for controls and offsets.

2. Need for Regulatory Analysis. Several commenters argued that implementation of the regulations represents a significant regulatory action and, pursuant to Executive Order 12044, requires preparation of a regulatory analysis. Prior to the publication of the proposed regulations, the Department prepared a Negative Declaration and Regulatory Analysis. That document examined the criteria for determining whether the proposed regulations constituted a significant regulatory action. The Department found that: (1) Failure to promulgate rules could have a major regionwide impact on state and local governments because a failure to adequately control air emissions could affect the eligibility of state and local governments to receive Federal financial assistance. The Clean Air Act requires that state and local governments achieve national ambient air quality standards by specific dates in order to maintain eligibility for specified Federal grants; (2) The proposed regulations would impose new recordkeeping and reporting requirements on the oil and gas industry. However, the impact of these requirements was diminished for certain lessees operating in certain areas because they had already voluntarily compiled air quality information for proposed activities which corresponded to that required under the proposed regulations; (3) The proposed regulations would not involve a potential conflict between environmental and other considerations; (4) Although the proposed regulations would have a modest impact on the budget and personnel of the GS, they would not have a major impact on other programs of the Department, other Federal agencies, or the allocation of Federal funds; and (5) Based on an analysis of the projected cost to industry of complying with the proposed regulations, they were not estimated to have an annual economic consequence of $100 million or more. Based on these conclusions, the Department determined that the implementation of the regulations, as proposed, was a significant action but, because the potential cost of compliance was under $100 million, the preparation of a regulatory analysis was not required.

A review of that determination, in light of the comments received, failed to show any basis for changing the determination. In fact, the adoption of emission exemption rate formulas will reduce the overall cost of compliance by increasing the number of lessees exempt from regulatory review under the program and, thereby, decreasing the number of lessees who will have to model emissions to determine whether they produce onshore ambient air concentrations above the significant levels. We therefore maintain our finding that a regulatory analysis is not called for by the criteria set out in Executive Order 12044.

3. Exemptions. The proposed regulations exempted from further regulatory review OCS facilities with less than 100 tons per year uncontrolled emissions of each pollutant or less than 50 tons per year of controlled emissions of each pollutant. These exemption levels were applied to all facilities regardless of their distance from shore. In the preamble to the proposed regulations the Department cited an analysis by EPA which indicated that emissions of less than 100 tons per year would not cause onshore ambient concentrations of air pollutants that exceed the 24-hour, 3-hour, and 1-hour EPA significance levels. The Department also noted that although a distance exemption could be established, data were insufficient to justify such an exemption in the proposed rule.

Several commenters favored the development of an exemption formula which incorporates a distance consideration. The American Petroleum Institute (API) derived an emission rate-distance formula which received wide industry backing. API began their analysis by using EPA's emission exemption rate of 100 tons per year for a source locating in a nonattainment area. Based on assumed and observed meteorological data. API then calculated the maximum ground level ambient air concentration of emissions from the source and substituted this concentration for the EPA significance levels. Then API calculated the emission rates and offshore source distances that would produce this concentration at the shoreline. The API formula is $E=80D$, where E is emissions of air pollutants expressed in tons per year and D is distance from an onshore area expressed in miles. Thus, facilities with emissions of less than 240 tons per year at 3 miles, 800 tons per year at 10 miles, and 4,000 tons per year at 50 miles would be exempt.

Most of those who favored the adoption of the API formula said that if the Department decides to retain exemptions based on an emission rate alone, the distinction drawn between controlled and uncontrolled emissions should be dropped and the Clean Air Act exemption levels of 100 tons per year for facilities impacting nonattainment areas and 250 tons per year for facilities impacting attainment areas should be adopted. Other commenters recommended exempting facilities more than 8 miles from shore, and there was a scattering of support for more lenient emission rate exemptions (e.g. one commenter recommended 750 tons per year, and another 400 tons per year at 8 miles.)

Many commenters argued that the proposed exemption levels were not stringent enough and that when this fact is coupled with other alleged deficiencies in the proposed regulatory scheme (i.e. the recognition of atmospheric dilution, the adoption of significance levels and the absence of controls for cumulative effects), the result is insufficient protection for the air quality of areas with more stringent State standards. They recommended the adoption of exemption levels equivalent to those allowed by the onshore jurisdiction potentially affected by emissions from offshore facilities (e.g. 25 pounds per hour, or 250 pounds per day for facilities located adjacent to many jurisdictions in California).

Emission rate-distance formulas, developed by the GS, have been incorporated into the final regulations. However, an approach different from that recommended by API has been adopted. The GS adopted an approach suggested by EPA which is designed to insure that exempt OCS facilities will not produce onshore ambient air concentrations above the adopted significance levels. Because of the decision to rely on significance levels to make the "significantly affected" determination (except for volatile organic compounds (VOC)--see "Volatile Organic Compounds"), the distance-emission rate approach designed by GS is preferable to that suggested by API.

In developing the exemption formulas, the GS assumed source characteristics and meteorological conditions similar to those encountered on the OCS. Working with the adopted significance levels, the GS then calculated, for each pollutant and averaging time, the emission rates that would produce, from OCS sources at varying distances from shore, onshore ambient air concentrations equivalent to the significance levels. Three pollutants (total suspended particulates (TSP), sulfur dioxide (SO_2) and nitrogen oxides (NO_x)) produced approximately the same results showing that a 100 tons per year emission rate for a facility located three statute miles from shore would not exceed significance levels onshore. This emission rate is the exemption level used by EPA for new sources locating in nonattainment areas onshore. Because of the higher allowed concentration for carbon monoxide, the GS developed a separate formula for carbon monoxide (CO).

The Department's exemption formulas are: $E=3400D^{2/3}$ for CO and $E = 33.3D$ for TSP, SO_2 NO_x and VOC (see "Volatile Organic Compounds"), where E is the emission exemption amount expressed in tons per year and D is distance from an onshore area expressed in statute miles. Under these formulas, facilities with emissions of SO_2, for example, of 100 tons or less at 3 miles 333 tons or less at 10 miles, and 1665 tons or less at 50 miles would be exempt from further air quality review.

The adopted exemption formulas are more conservative than the developed by API because they were based on different assumptions concerning the effective release height and meteorological conditions. It is important to remember that an exemption level serves only as a screen to eliminate from review those sources which, when considered alone, will have no significant effect on the air quality of any onshore area.

In response to the comments concerning the ability of the proposed regulatory scheme to protect more stringent State standards, the Department is publishing, in a separate Notice, proposed regulations which would establish a more stringent program for application to those OCS facilities located off the coast of California.

4. Modeling and Atmospheric Dilution. The proposed regulations required a lessee to model emissions other than volatile organic compounds (hereinafter called "non-VOC emissions") from a non-exempt facility to determine whether they would produce onshore ambient air concentrations above the significance levels. The lessee was required to use a model approved by EPA.

Several commenters pointed out that there is no overwater model which EPA has "approved for use." They argued that the EPA approved models, especially when they are applied to overwater conditions, have unacceptably high margins of error--being overly conservative or not conservative enough depending on the respondent. They recommended dropping the EPA approval provision to allow the use of new models which better predict overwater plume behavior and more accurately describe offshore conditions. One commenter expressed opposition to any provision which would mandate the use of a given model, and another opposed the use of models altogether. The latter commenter suggested conducting actual monitoring to determine whether emissions from an OCS facility have a significant onshore effect.

Some commenters recommended that the Department should develop a list of acceptable models for offshore application, and one commenter suggested that the acceptable model or models contain guidelines on the factors to be considered in using the model. Another commenter objected to the use of models for predicting long term impacts. This respondent argued that models are capable of predicting short term impacts but are not suited for measurement of long term impacts and recommended the development of a model validation process. A number of commenters believed that the model approval process should be expanded to include a role for States.

Many commenters also criticized the establishment of an exemption formula which incorporates a distance consideration and opposed any regulatory provision that allows the dilution of air pollutants during atmospheric transport to be considered in determining whether emissions from an offshore facility significantly affect an onshore area. They argued that such an approach is analogous to the use of tall stacks as a control measure—a technique designed to lower ground level air concentration which has not been allowed by some courts.

The Act requires that the Department devise a regulatory scheme which requires the control of emissions from OCS facilities only when these emissions would have significant effects on the air quality of an onshore area. It is the position of the Department that this compels development of a method of calculating the onshore concentration of an offshore emission. Modeling is a common and accepted method of predicting the impact of emissions on air ambient concentrations. EPA, for example, uses the results of such models for determining the applicability of certain new source requirements, such as offsets. Thus, the agency with primary responsibility for protecting the Nation's air quality recognizes the ability of the atmosphere to dilute emissions during transport, as long as excessive stack heights and other illegal dispersion techniques are not used. The Department has adopted this analysis.

The Department has retained the modeling requirement established in the proposed regulations but, in recognition of the comments received, has initiated a step-by-step process which will lead to the development of an acceptable overwater model or models. At the present time, GS is reviewing the list of EPA approved models and will select one or two which lessees must use in the air quality program. During the next year, these models will be adapted for overwater applications. Also, during the next two to three years, the Bureau of Land Management (BLM), Department of the Interior, will conduct actual field tests off the coast of southern California to develop diffusion coefficients for overwater conditions. These diffusion coefficients will be used to validate models the Director has approved for use. Finally, the GS will establish a mechanism, similar to the one used by EPA, under which interested outside parties can recommend new models or adaptations to existing models to the GS. Each recommendation will be subject to public review and comment before being added to the list of approved models.

It is the Department's position that the benefits to be derived from requiring the use of an approved model or models outweigh the loss of "flexibility" advocated by some commenters. Despite the deficiencies in existing EPA models, their use, in the short term, is preferable to the controversies that would arise if all the parties involved were allowed to pick different models to predict and analyze the onshore air quality impacts of offshore operations.

It should be noted that EPA provides information on its approved models explaining how they work and how to use them. The Survey plans to provide similar information on the models which the Director approves for use. Finally, the Department disagrees with those who contend that, although the EPA models can estimate short term impacts, they cannot estimate long term (i.e. annual) impacts. Several EPA models calculate one hour averages of relative concentrations and sum these to estimate the annual average impact of the source. Thus the long term impacts are based on the cumulative effect of short term impacts.

The Department disagrees with comments concerning the impact of atmospheric dilution in its regulatory program. Any effort to equate atmospheric dilution of offshore emissions to using tall stacks is faulty for three reasons. First, the use of models to predict onshore impacts of offshore emissions does not constitute, as the commenters suggest, a "form of emission regulation." Instead, the models are used to answer the threshold question—is there a significant impact on the air quality of an onshore area? If the models predict an impact in excess of that level which is defined as significant, then emission limitations and, in some instances, offsets are required. Second, the outcome in the "tall stack" cases cited by commenters was based on the court's interpretation of specific language in Section 110 (a)(2)(b) of the Clean Air Act, as amended (42 U.S.C. 1857c-5(a)(2)(B)). No similar language appears in the OCS Lands Act Amendments of 1978. Third, it is clear that Congress intended that the Department should consider distance in determining whether emissions from an OCS facility should be controlled:

> It is expected that some activities may not have significant effects because of distance from shore or meteorological conditions that blow the pollution out to sea. If an OCS activity or facility is determined to have no such significant effect, when, for example, it is located many miles from the coast, the requirement of the regulations under section 5(a)(8) would not apply. (see House Conf. Rep. No. 95-1474, p. 86).

This statement reflects the understanding that emissions further from shore are less likely to cause increases in the onshore ambient air concentrations than emissions released closer to the onshore area. Thus, a regulatory program which considers atmospheric dilution is consistent with this mandate.

5. Significance Levels. The proposed regulations adopted the significance levels established by EPA to control sources locating in a "clean" area but which would impact a nonattainment area. (see "Emission Offset Interpretive Ruling", 44 FR 3283 January 16, 1979). Non-VOC emissions from a non-exempt OCS facility were compared to these EPA significance levels to determine whether the emissions would significantly affect the air quality of an onshore area. These significance levels are approximately two percent of the

national ambient air quality standards and correspond closely to the Class I increments under the Prevention of Significant Deterioration (PSD) Program.

Several commenters argued that the proposed significance levels were too stringent and they recommended the adoption of levels that are 10 percent of the national ambient air quality standards. They maintained that this level would account for the natural variability of atmospheric background concentrations of the pollutants of concern and the limitations inherent in equipment and techniques which measure ambient pollutant concentrations. Other commenters, noting the relationship between the significance levels and the Class I increments, recommended basing the significance levels on the Class II increments, which are 25% of the national ambient air quality standards. They pointed out that Class II increments apply to the areas where most people live and would be more reasonable for determining a significant effect than the Class I increments.

Other commenters argued that the significance levels are not stringent enough and that an increase in air contaminants of up to two percent of the national ambient air quality standards is too much for nonattainment areas which are struggling to meet the standards. They recommended reducing the exemption level (see "Exemptions"), eliminating the modeling requirement (see "Modeling") and the significance levels, and requiring all emissions from nonexempt facilities to be fully reduced or offset.

It is the position of the Department that the use of EPA's significance levels in these air quality regulations is prudent. To fulfill the requirements of the Act, a regulatory scheme must be designed so that offshore emissions are converted into onshore ambient air concentrations which are then measured against a criterion to determine whether the onshore air quality is sufficiently affected to warrant regulation of the offshore source. EPA encounters an analogous situation where emissions from new sources locating in "clean" areas may adversely affect a nonattainment area. To address this situation EPA established a set of significance levels and stipulated that if the emissions from the new source locating in the "clean" area would cause ambient air concentrations in excess of these levels in the actual area of nonattainment, mitigation measures are necessary. Because the onshore situation for which the EPA significance levels were designed is similar to the offshore situation, the levels have been incorporated into this regulatory program. The levels are stringent enough to assure that onshore effects from offshore operations will be inconsequential but are not overly burdensome to operators on the OCS.

6. Volatile Organic Compounds (VOCs). Under the proposed regulations, a "36-hour travel time" criterion was used to determine whether emissions of VOCs (i.e. compounds which react with other pollutants in the atmosphere to form ozone) from a non-exempt facility significantly affect the air quality of a State. The "36-hour travel time" criterion, adopted from EPA, was selected because EPA informed the Department that acceptable reactive models for calculating ozone concentrations resulting from VOC emissions from individual sources do not exist. EPA's rationale for this criterion was that most reactions leading to the formation of ozone occur during this 36-hour timeframe.

In the preamble to the proposed regulations, the Department noted that EPA was reevaluating the "36-hour travel time" criterion and might change it after the Department published its proposed or final regulations.

The Department indicated that it would evaluate any new EPA approach for inclusion in the air quality regulations. On September 5, 1979, EPA withdrew the "36-hour travel time" criterion and proposed a requirement that sources locating in attainment or unclassified areas (the location of all OCS sources) monitor for one year (or for a shorter period specified by EPA) to determine whether there is an ozone violation at the site. If at least one ozone violation occurs during the monitoring period, the source generally would be subject to all EPA regulations which apply to sources locating in nonattainment areas. If no onsite violation occurred, the source would be subject to all EPA regulations which apply to sources locating in attainment areas.

Commenters on the proposed regulations gave very little support for the retention of the "36-hour travel time" criterion. Many commenters claimed that the criterion had no scientific basis and that the regulatory requirements were difficult to understand and apply. Alternative recommended approaches included adopting any future EPA approach, treating VOCs like the other criteria pollutants, or requiring control of all non-exempt VOC sources.

The Department has dropped the "36-hour travel time" criterion and has decided against following EPA's new approach to VOC emission control. An approach has been adopted which will require control of all facilities not exempt for VOC. The Department will treat offshore VOC emissions much like EPA treats them onshore. That is to say, the exemption level of 100 tons per year at three miles will apply. Sources at distances of more than three miles from shore will be exempt in accordance with the emission exemption amount determined by using the formula E=33.3D (see Exemption). All VOC emissions which are not exempted will be controlled.

The decision not to adopt EPA's new approach was based on the belief that onsite ambient air monitoring would pose unacceptable technologic and economic problems. It is unclear how sensitive monitoring equipment would react to the marine environment, and the placement of a monitoring buoy or tower on the OCS does not appear to be worth the cost, compared to the regulatory approach adopted. The decision not to treat VOCs like the other criteria pollutants was based on the absence of an acceptable reactive model. Should EPA approve a reactive model, the Department will reevaluate the regulations to determine the feasibility of treating VOCs as other criteria pollutants.

7. Best Available Control Technology (BACT). Under the proposed regulations, any lessee proposing a facility whose non-VOC air pollutants would significantly affect the air quality of a nonattainment area would have been required to take any measures necessary to reduce or offset the emissions from the facility so that the pollutant concentrations would not affect the nonattainment area. In determining the appropriate level of control for facilities with non-VOC emissions that significantly affect the air quality of an attainment or unclassifiable area, the lessee would follow a two-step approach.

First, the lessee would have identified BACT in the exploration plan or development and production plan. Next, assuming the application of BACT, the lessee would have modeled emissions of SO_2 and TSP to determine whether they would have produced ambient air concentrations in the attainment or unclassifiable area above the maximum allowable increments prescribed in the proposed regulations. If concentrations exceeded the maximum allowable increments, the lessee, in addition to applying BACT, would have been required to take whatever additional measures were necessary to reduce or offset the emissions down to a level at which the maximum allowable increments would not have been exceeded. The same general approach would have been followed for a facility with VOC emissions which were within 36 hours travel time of a nonattainment, attainment, or unclassifiable area. Finally, when modeling indicated that emissions from an existing or temporary facility would have significantly affected any nonattainment, attainment, or unclassifiable area of a State, the lessee would have been required to install BACT.

Many commenters complained that the imposition of the BACT requirement will impede the installation of the most cost effective technologies. They like the approach that would be followed when emissions significantly affect a nonattainment area (where some level of control less than BACT might be adequate) and complained that it is excessive to require a more stringent level of control when the same emissions significantly affect an attainment or unclassifiable area. They recommended deleting the BACT requirement and allowing the lessee to use a combination of controls and offsets to achieve the necessary reductions.

Other commenters pointed to the discrepancy between the level of control required for emissions significantly affecting a nonattainment area and those significantly affecting an attainment or unclassifiable area, and recommended modifying the regulations to more closely correspond with the level of control required by EPA in nonattainment areas (i.e. EPA's lowest achievable emission rate (LAER) standard). They did, however, support the use of BACT to control emissions significantly affecting attainment or unclassifiable areas.

The Department has decided to adopt an approach which more closely parallels the one used by EPA to control emissions which significantly affect a nonattainment area. The Department believes that it is important to require the installation of control equipment on OCS sources affecting the air quality of nonattainment areas. However, the Department has rejected the recommendation that EPA's standard of LAER be imposed on sources significantly affecting a nonattainment area. The LAER standard, unlike the BACT standard, gives no consideration to economic, environmental, or technological factors and thus conflicts with the best available and safest technologies standard contained in Section 21(b) of the Act. For this reason, the Department will require the use of BACT to control emissions which significantly affect a nonattainment area. In addition to applying BACT, a lessee of a facility which significantly affects a nonattainment area will also be required to install additional control equipment, obtain offsets, in order to fully reduce the emissions from the facility. For example, assume that a facility is found to significantly affect a nonattainment area, and that the total emissions of a particular air pollutant which must be fully reduced are 500 tons per year. Under the final regulations the lessee first must apply BACT. Assume that the installation of BACT reduces the emission of the pollutant down to 200 tons per year. In this instance, the lessee would then be required to install additional control equipment or obtain offsets (or a combination of the two) to fully reduce or offset the remaining emissions attributable to the facility by 200 tons.

The Department has also retained the requirement that BACT be applied when emissions would significantly affect an attainment area and when emissions from a temporary facility would significantly affect an nonattainment, attainment, or unclassified area. Additionally, the installation of BACT may be required, in some instances, for existing facilities.

8. Prevention of Significant Deterioration (PSD). The proposed regulations required lessees to control emissions from facilities which significantly affect the air quality of onshore areas where the air quality is better than the

primary or secondary ambient air quality standards.

A number of commenters argued that the Secretary does not have the authority, under Section 5(a)(8) of the Act, to include PSD requirements in the regulations. They asserted that the statutory language, which mandates "compliance with the national ambient air quality standards," limits the Department's regulatory authority to those onshore situations where the primary and secondary ambient air quality standards, established by the Clean Air Act, are being violated. They also asserted that the regulatory program established for nonattainment areas is totally separate and independent of the PSD regulatory program and that by using the term "national ambient air quality standards" Congress was referring only to the nonattainment program. Finally, some commenters pointed out that the offshore operations, unlike land based operations, usually are confined to the location where the oil or gas are discovered and cannot be relocated.

Other commenters, however, supported the impositon of controls on OCS facilities which significantly affect attainment or unclassifiable areas. They argued that the legislative history clearly indicates that the Department's regulations must insure that OCS sources will not have an adverse effect upon the air quality or attainment areas. One commenter pointed out that the PSD increments are federally-established and nationally applicable standards for attainment areas and operate in much the same way as the primary and secondary standards operate for nonattainment areas. Further, they argued that the PSD program, when incorporated into the State Implementation Plan, becomes a more stringent State program which, according to the Conference Report, must not be adversely affected by the offshore drilling program. Another commenter agreed that the PSD program should be included in the final regulations, but complained that the regulatory scheme as proposed is not sufficiently stringent. The commenter suggested that all OCS facilities should be required to install LAER whether or not the facility would significantly affect an attainment or nonattainment area. This commenter also asserted that in order to prevent the significant deterioration of onshore air quality, it would be necessary for the Department to require in all cases, the modeling of cumulative impacts.

Also, one commenter believed that the proposed rules failed to recognize that some of the allowable increment may have been consumed by other new sources which have previously been located in an area. This commenter also argued that the OCS facility should not be allowed to consume the entire PSD increment because the clean air area would then be put at the same economic disadvantage as a nonattainment area when attempting to site new sources. The commenter recommended that the regulations should limit the offshore facilities to a certain percentage of the annual and short term increment (25 percent and 75 percent, respectively). Finally, one commenter suggested that the decision on the PSD requirements be delayed until the D.C. Court of Appeals issued its final ruling in Alabama Power Co. v. Costle.

After carefully considering the arguments presented by the many commenters, the Department has decided that it is legally authorized to retain the provisions which require compliance with standards established by EPA to prevent the significant deterioration of onshore air quality in attainment areas.

The Department believes that commenters are mistaken in their argument that, because of the statutory reference to "national ambient air quality standards," the authority of the Secretary is limited to control of OCS emissions affecting the air quality of nonattainment areas. We believe that Congress used the term "national ambient air quality standards pursuant to the Clean Air Act" in a broad sense to mean that the Secretary should promulgate regulations which insure the protection of air quality in attainment as well as nonattainment areas from degradation resulting from emissions from OCS operations. This interpretation is entirely consistent with the intent of Congress as expressed in the legislative history. Statements made on the House floor during the debate over the air quality provisions of the Act clearly demonstrate that Congress intended that all applicable aspects of the air quality regulatory program established under the Clean Air Act be extended to the program established under the Act (see 1978 Cong. Rec. H. 415-416, January 31, 1978). That the provisions of Part C of the Clean Air Act are "applicable" is underscored by the debates which occurred among the conferees during Conference Committee meetings. The point was made emphatically that if emissions from offshore operations are not regulated to the same extent as emissions from onshore operations, then onshore growth will be slowed in favor of offshore development (see Transcript of Conference Committee on OCS Lands Act Amendments, June 19, 1978). No distinction was made between attainment and nonattainment areas, strongly suggesting that Congress had no intention of creating a special exemption for offshore operations significantly affecting the air quality of an attainment area. Indeed, the legislative history indicates that once it is determined that offshore emissions significantly affect the air quality of onshore areas, these emissions are to be regulated regardless of attainment status.

The commenter who argued that the regulations fail to recognize that some of the allowable increases may have already been consumed is mistaken. The regulations clearly indicate that the "maximum allowable increases" for SO_2

and TSP are ceilings which cannot be exceeded within the applicable area. To calculate the acceptable emmission level, a lessee must combine the ambient air concentrations resulting from the projected emissions of TSP and SO_2 from the proposed OCS facility with those emissions of TSP and SO_2 from other onshore and offshore sources which contribute to the consumption of the maximum allowable increases.

The Department has rejected the suggestion that a lessee be limited to a percentage of the maximum allowable increases. Since EPA has not established this requirement for onshore sources, the Department has decided not to impose such a requirement on offshore operations. Finally, the D.C. Court of Appeals issued its final ruling in *Alabama Power v. Costle* on December 14, 1979. These final regulations contain no provisions or requirements which conflict with the ruling in that case.

9. *Offsets*. Under the proposed regulations, the lessees were allowed to use offsets instead of controls to reduce the emissions significantly affecting an onshore nonattainment area. In each instance, the lessee would be given a choice between the use of controls or offsets, or a combination of the two.

Several commenters questioned the Department's authority to require emission offsets from onshore facilities since these facilities are outside the Department's jurisdiction under the Act. Other commenters, who supported giving the lessees the choice of controlling or offsetting emissions, argued that the amount of offset required should be only that necessary to reduce the emissions to that level which would prevent violations of the national ambient air quality standards. They also argued that offsets should never be necessary where only an attainment area is affected. Finally, some commenters argued that the Department should require greater than one-to-one (1:1) offsets when emissions significantly affect nonattainment areas.

The Department has retained offset provisions in its final regulations. The offset requirement is discretionary; no absolute requirement for onshore offsets exists in the final regulations. Instead, lessees are given the choice, after the application of BACT (see "Best Available Control Technology"), of installing additional controls or obtaining onshore or offshore offsets.

It is the position of the Department that it would be unwise to limit the use of offsets as the commenters recommended. The decision to require full reduction of emissions which affect the air quality of nonattainment areas (through the application of BACT and whatever additional controls or offsets are necessary) is consistent with EPA's regulatory program. The provision regarding the use of offsets to prevent a violation of the PSD increments is consistent with EPA's program and is reasonable because it provides lessees with an alternative to installing more control equipment.

Finally, the Department has rejected the recommendation that the offset requirement for emissions significantly affecting a nonattainment area should be greater than 1:1. The Department believes that such a requirement would conflict with its legislative mandate. The Department is limited in preventing significant onshore effects and cannot impose a level of control which would leave the air cleaner, in effect, than it would have been if the OCS facility had never located offshore.

10. *Temporary Facilities*. The proposed regulations contained a definition of "temporary activities" which indicated that construction and drilling activities that occur in one location for less than three years would be considered temporary. The proposed rule required a lessee to apply BACT to temporary activities which significantly affect the air quality of any state.

Several commenters supported this approach. Others agreed with the BACT requirement but recommended shortening the timeframe provided in the definition of "temporary activities" from three years to one year. One respondent noted that EPA uses a two year exemption period onshore and suggested that two years is also appropriate offshore.

Many other commenters argued for a total exemption of all temporary activities, including all mobile drilling equipment and pipeline and platform construction activities, from the regulatory requirements. They asserted that extensive experience has shown that temporary facilities have no adverse onshore air quality impacts. They argued that the cost of regulating temporary activities is far greater than the benefits and reiterated that onshore temporary activities are exempt under EPA's regulations. Finally, several commenters took the position that temporary facilities, if regulated at all, should only be regulated if they affect nonattainment areas.

The Department has decided to retain the approach to the regulation of temporary facilities which appeared in the proposed regulations. First, the Act does not distinguish between temporary and permanent facilities; it directs the Secretary to control all activities authorized under the Act that would have significant effects on onshore air quality. In fact, Section 11(c)(1) of the Act specifically directs the Secretary to insure that air quality impacts from exploratory activities do not have adverse effects on a State's air quality. Second, the information available to the Department indicates that substantial emissions (in excess of 100 tons per year) may be associated with temporary drilling activities.

Finally, application of the BACT requirement to temporary facilities is consistent with EPA practices in that temporary activities are exempt from other regulatory requirements but, nevertheless, must install BACT. The Department's approach is different, however, from EPA's because OCS lessees will be required to install BACT only if their temporary activities cause significant onshore effects. Only the BACT level of control is required for temporary facilities, and not more stringent controls or offsets, because of the limited time that these activities will emit pollutants and the difficulties and inequities that would be involved in obtaining offsets for temporary facilities.

The Department also intends to retain a definition of "temporary facility" which includes exploration and development drilling activities which are conducted in one location for less than three years. The definition also encompasses construction activities. The decision to classify construction activities as temporary was adopted from EPA's regulations. The three year time frame is based on the GS's experience with the time normally associated with exploration or development drilling activities.

11. Existing Facilities. Under the proposed regulations, an activity which had commenced operations prior to the effective date of the final regulations was subject to control if an affected State could demonstrate, and subsequent analyses would affirm, that emissions from the facility were significantly affecting the air quality of an onshore area. The criteria used to make the necessary determinations were the same as those applied to new or modified facilities, but the maximum level of control was different. Existing facilities with emissions which significantly affect onshore areas were required only to apply BACT.

Many commenters argued that existing facilities should be exempt from any regulatory requirements related to air emissions. They argued that Congress did not intend to regulate emissions from existing facilities, that retrofitting existing facilities is very difficult and expensive, and that existing facilities are not known to have any detectable impact on onshore air quality.

The Department has retained the regulatory requirements of the proposed rules which are applicable to existing facilities. There is no evidence to suggest that Congress intended to exempt existing facilities from the regulatory program. Section 5(a)(8) of the Act draws no distinction between existing and proposed facilities. Indeed, section 5(a) of the Act specifically states that rules and regulations promulgated under the Act shall apply as of their effective date, to all operations conducted under a lease issued or maintained under the provisions of the Act. The House Conference Report explains this language by stating that regulations are to be applicable to any lease in effect at the date of promulgation, as well as to any lease to be let in the future (see House Conf. Rep. No. 95-1474 p. 82).

The Department believes that the approach adopted gives adequate consideration to the problems associated with retrofitting existing facilities, particularly since the application of BACT takes into account economic factors.

12. Cumulative Effects. The proposed regulations contained no specific provisions addressing the possible cumulative effects of sources locating in close proximity to each other. Numerous commenters argued that the final regulations must address more adequately the problem of cumulative effects. The Department's analysis of technical reports submitted to substantiate both sides on this issue convinced us that, in certain infrequent instances, it is possible for emissions from OCS sources to interact in such a way as to increase notably onshore ambient air concentrations of pollutants. Spacing of facilities is such, however, that it would be unusual for this to occur. However, to insure that cumulative effects are recognized and, if necessary, regulated, a provision has been added to the final regulations which gives the Director the authority to require a lessee to use models which demonstrate the effect on onshore air quality of emissions from a proposed OCS facility in combination with emissions from other OCS facilities in the area. Thus, the Director can require the lessee to use multisource models to provide information concerning cumulative effects.

Additionally, a section has been added which provides that if a State demonstrates to the Director that emissions from an otherwise exempt facility will, either individually or in combination with other OCS emissions, significantly affect the air quality of an onshore area, or the Director believes that an otherwise exempt facility may cause significantly air quality effects onshore, the Director may require the lessee to submit additional information. This provision was added to address the situation in which a State or the Director believes that an OCS facillity is having significant impacts on the air quality of an onshore area even though the emissions from the facility are below the exemption level. This might occur if the emissions from the facility are acting in combination with emissions from a nearby OCS facility to cause cumulative impacts. It is the position of the Department that the incorporation of these provisions insures that cumulative impacts of OCS facilities on the air quality of onshore areas will be identified and effectively controlled.

SECTION-BY-SECTION DISCUSSION

1. Section 250.2 Definitions

Attainment areas.—One commenter urged that the definition of "attainment area" be rephrased to make it absolutely clear that an area can be "in attainment" for one pollutant and "in nonattainment" for another. The definition that appeared in the proposed regulations and that has been adopted in the final regulations is the same as EPA's definition. Retention of this definition is important because the final regulations incorporate most of EPA's PSD program and the classification system employed by the two agencies must be consistent. In any case, the definition is sufficiently clear to indicate that an area may be in attainment status for one air pollutant and in nonattainment status for another air pollutant.

Best Available Control Technology (BACT).—Several commenters raised objections to the definition of "best available control technology". One respondent urged the Department to adopt, word for word, EPA's definition of BACT. Another argued that the definition of BACT should not encompass production processes. One commenter argued that the BACT definition should be modified to recognize the paramount importance of safety and economic factors and space and weight limitations on OCS facilities. This person recommended allowing BACT certification of individual rigs and other portable equipment. Finally, one respondent suggested that lessees should be required to identify and justify the technology chosen only if the GS has specifically identified BACT equipment which the lessee does not propose to use.

The Department has decided to modify its definition of BACT to more closely parallel EPA's definition. The definition in the proposed regulations gave the mistaken impression that methods, such as offsets, which do not result in an actual decrease in emissions could be employed to satisfy the BACT requirement. This is not the case and language has been added to make this clear. The BACT determination process was chosen because it gives recognition to energy, environmental, and economic impacts and other costs. The Department recognizes the space and weight limitations on OCS facilities and will consider these and other factors in the BACT determination process. The Department also believes that it is appropriate, particularly in the initial stages, for lessees to identify BACT. As time goes on, certain technologies, methods systems, and techniques will be recognized as BACT, and the burden of identifying BACT will be reduced.

In developing these regulations, the Department must comply with the provisions of Section 21(b) of the Act which requires, "on all new drilling and production operations and, wherever practicable, on existing operations, the use of the best available and safest technologies which the Secretary determines to be economically feasible, wherever failure of equipment would have a significant effect on safety, health, or the environment, except where the Secretary determines that the incremental benefits are clearly insufficient to justify the incremental costs of utilizing such technologies." Control equipment installed to satisfy the BACT requirement will be deemed to satisfy the Department's best available and safest technology requirement as well.

Commence, Facilities and Source.—The proposed regulations contained the terms "activities", "facilities", "sources", and "commenced", but none of these terms was defined. The absence of definitions for these terms, and the way they were used throughout the proposed regulations, confused reviewers. A number of commenters suggested that definitions of these terms be included in the final regulations. Several felt that the term "facilities" should be substituted for the word "activities". Others suggested that "activity" should be defined as broadly as possible to avoid situations where a number of individual activities in close proximity to each other, which in aggregate may have a significant onshore impact, are exempt from the regulatory requirement. One commenter believed that the term "activity" should be defined to include all emissions at an individual platform and should include emissions from ships and barges associated with the platform. Several commenters suggested that "facility" be defined as all emission points on an individual platform and "source" be defined as each specific piece of equipment that results in emissions. Another recommended that "OCS activity" and "facility" both be defined as "an installation including all platforms joined above water."

In response to these comments the term "facility" has been substituted for the term "activities" and definitions of the terms "facility" and "source" have been incorporated into the regulations. A platform and all equipment directly associated with a platform will be considered to be one facility. Each emission point on the facility is a source.

Multiple installations or devices may be considered part of a single facility if they are related directly to the production of oil or gas from a single site. Emissions from an offshore storage and treatment unit are to be treated as if from a source that is part of the facility. Also, vessels used to transfer production away from a facility on the OCS shall be considered part of the facility for the entire period of time that the vessel is moored or otherwise physically attached to the facility. Thus, for purposes of calculating the total emissions, all emissions from such a vessel must be treated as emissions from a source on the facility during that period in which the vessel is physically attached to the facility. Sources on support vessels other than vessels used to transfer production from a facility will not be considered part of the facility.

The term "commenced" has been deleted from the regulations and a definition of "existing facility" has been added to establish a more precise criterion that the GS will apply to determine whether a facility is regulated by § 250.57-1 or § 250.57-2.

Onshore Area of a State.—One commenter suggested that the definition of "onshore area of a State" be extended to the three mile territorial limit of the State rather than landward of the mean high water mark. According to the commenter this is necessary because air pollutants can be deposited on surface waters.

The Department has not made this change because it would conflict with the intent of Congress. The primary concern under section 5(a)(8) is the protection of the air quality of onshore areas of the States. This is evidenced by language in the Conference Report which states "(T)he standards of applicability the conferees intended * * * is that when a determination is made that offshore operations may have or are having a significant effect on the air quality of an adjacent onshore area * * * regulations are to be promulgated." Accordingly, the Department believes that it is appropriate to measure the impact of the offshore emission landward of the shoreline instead of at the 3-mile territorial limit.

Projected Emissions.--The final regulations contain a definition of the term "projected emissions". This change was incorporated in response to many commenters who questioned the validity of the distinction drawn in the proposed regulations between controlled and uncontrolled emissions. They pointed out that the D.C. Circuit Court of Appeals in Alabama Power Co. v. Costle, No. 78-1006, (D.C. Cir. 1979) (Summary Opinion, June 18, 1979; final decision December 14, 1979) invalidated an EPA regulation which required calculation of emissions based on uncontrolled emissions. The Court held that the "potential to emit" of a source must be calculated on the basis of the actual levels of emissions which would result after the application of whatever air pollution control equipment may be incorporated into the design of the facility. The Department agrees with the commenters that, in light of the court's opinion, it would be inappropriate for its air quality regulations to distinguish between controlled and uncontrolled emissions. Accordingly, the term "projected emissions" was added to clarify the basis for calculating emissions from OCS facilities.

Volatile Organic Compound (VOC).--Several commenters suggested that the definition of "Volatile Organic Compound" be modified to exclude methane and ethane. Another recommended that the definition should create an exception for carbon monoxide, carbon dioxide, carbonic acid, metallic carbides and carbonates, and ammonium carbonate. Finally, two commenters recommended a change in the definition to make it clear that the unreactive compounds specified are exempt, in all cases, from the definition.

The Department has adopted the recommendation that the exempt status of the unreactive compounds be clarified by changing the term "may be exempt" to "are exempt". However, the definition has not been changed to name the exempt unreactive hydrocarbons or to expand the list. The definition provides that unreactive compounds specified by EPA in Table 1 of 42 FR 35314, July 8, 1977 are not to be treated as volatile organic compounds. This list includes methane; ethane; 1,1,1-Trichloroethane (Methyl Chloroform); and Trichlorotrifloroethane (Freon 113). Because this table is referenced, methane and ethane clearly are excluded from the definition. The reference to the EPA table has been retained so that future changes in the table will be incorporated automatically into these regulations.

2. Section 250.34-3 Information Requirements

This section requires the submission of air pollution emission data as a part of the exploration plans or development and production plans which must be submitted and approved under 30 CFR 250.34 prior to the initiation of exploration, development, or production activities on any leased OCS area. One commenter objected to making air quality determinations a part of the plan approval process. This commenter suggested that the proper time for a decision is during the preparation of the environmental impact statement for each lease sale. This suggestion is impractical. The onshore effects of offshore operations cannot be assessed adequately until detailed information about each facility, such as the exact distance from shore and the number of wells and type of generators to be used, is available. This type of information is not available until after a lease sale. For this reason a case-by-case examination of the potential of each facility to significantly affect the air quality of onshore areas is necessary at the time that detailed plans for exploration or development and production activities on the lease are submitted.

Several commenters urged that the Department reduce the information requirements to the minimum necessary to determine whether emission controls are required. They referred to the President's recent Executive Order No. 12044 which calls for regulations to be as simple and clear as possible. The regulations are designed to comply with the President's order by elimi-

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nating all unnecessary reporting. To implement this, the regulations state that the lessee is required to submit only that information needed to make the requisite findings under the regulatory program. Thus, a lessee who finds that emissions from the proposed facility fall under the exemption level would not be required to provide any further information because it would be clear, as a result of calculating the projected emissions, that no emission control is required. In addition, 30 CFR 250.34-3(a) and 250.34-3(b) allow a lessee to reference information in earlier Environmental Reports prepared for the geographic area by identifying the information and indicating a source for obtaining copies of the cited materials. Thus it is necessary for the lessee to resubmit information which has appeared in earlier Environmental Reports. For these reasons, the Department has rejected the suggestion of one commenter that the lessee be required, in every instance, to provide all the information listed in § 250.34-3(a)(4)(ii).

Several commenters recommended deletion of the provisions requiring a lessee to provide information on each onshore source of air pollution associated with the proposed offshore facility. They argued that the requirement for information about onshore emissions is duplicative, irrelevant, and not within the authority of the Secretary. This information requirement first appeared in the January 1978 regulations issued by the Department of Interior (30 CFR 250.34, 43 FR 3880) as a result of an agreement between the Department and the National Oceanic and Atmospheric Administration. The regulations required the submission of air quality information to assist States with approved coastal zone management programs in evaluating consistency determinations. It has been included in these regulations for that same purpose.

One commenter urged that the regulations clarify the meaning of the term "load factor," which appeared in the proposed regulations in the information requirements section. The term "load factor" has been eliminated from the final regulations. To calculate whether a projected emission is exempt from control under the regulations, the lessee must use the anticipated highest annual total emissions from each facility for each air pollutant.

One commenter recommended that lessees be required to note specifically which emission factors were used in the calculation of the projected emissions. The regulations require that the lessee describe the bases of all calculations; this would include the emission factors used.

Several comments were received concerning the provision in the proposed regulations requiring the lessee to identify any emission reduction control technology which exists that would achieve a greater reduction in emissions than the technology the lessee proposes to use and present the reasons why the lessee should not be required to use this technology. One commenter argued that such a requirement is unnecessary and unreasonable. Other commenters, on the other hand, supported this requirement. The requirement for submitting information on alternative control technologies has been deleted in the final regulations. However, the lessee is required to explain the basis for the technology proposed as BACT. This would include a discussion of alternative technologies.

One commenter asserted that operators in the Western Gulf of Mexico should be required to submit air quality information regardless of their Environmental Report exemption status. The Department agrees with this comment and has incorporated language in §§ 250.34-1(a)(2) and 250.34-2(a)(3) to indicate that the Director has the authority to require such information in the absence of an Environmental Report.

Several other changes have been made in §§ 250.34-3(a)(4)(ii)(A) and 250.34-3(b)(4)(ii)(A) related to the calculation of projected emissions from a facility. The requirement for expressing the emission from each source in "maximum anticipated pounds per hour" has been eliminated. Instead, for facilities described in development and production plans, a requirement for a frequency distribution of total emission from a facility, expressed in pounds per day, is included. This change enables the Department to evaluate whether any short term fluctuations in emissions from development and production facilities could cause problems. Additionally, lessees proposing modifications to existing facilities are required to submit information on both the incremental amount of the modified emissions and the total of any new and pre-existing emissions from the modified facility. This language was added to make it clear that when a lessee adds one or more new sources to an existing facility, the total emissions from the facility must be recalculated to determine whether the exemption levels are exceeded. In adopting this approach the Department rejected the suggestion of some commenters that only the additional emissions resulting from the new sources on the existing facility be considered in calculating whether emissions significantly affect the air quality of an onshore area. If this suggestion were adopted, modificatons could result in emissions which, when considered alone, would be under the exemption levels but which would cause, when combined with the existing emissions, significant effects on a State's air quality. The Department chose to require an analysis of the total emissions from a modified facility to insure adequate long term protection of onshore air quality.

A provision has been added which indicates that the Director may require a lessee to use models which demonstrate the onshore effect of emissions from a proposed facility in combination with the emissions from other OCS facilities in the area (see "Cumulative Effects").

The final regulations indicate that models must be approved by the Director instead of by EPA (see "Models") and require the use of the best meteorological information and data available. Many commenters legitimately pointed out that the quantity and quality of meteorological information and data vary from area to area and that the proposed regulations, which cited EPA's "Guidelines on Air Quality Models," did not give any direction on what type of information or data would be required. The new language is designed to provide the necessary direction.

3. Section 250.57-1 Facilities Described in a New or Revised Exploration Plan or Development and Production Plan

Sections 250.57-1(a) and (c) provide that all new or modified exploration plans and development and production plans deemed submitted under §§ 250.34-1(a) or 250.34-2(a) on or after June 2, 1980 shall be subject to the regulatory program established in § 250.57-1.

Section 250.57-1(b) authorizes the Director to review any exploration plan and development and production plan which was deemed submitted or approved by GS prior to June 2, 1980 to determine whether any facility described in such a plan should, because it has the potential to significantly affect onshore air quality, be subject to § 250.57-1. It also sets forth some general criteria which the Director shall apply in determining whether this review should be conducted and whether the facility reviewed should be subject to § 250.57-1. Any facility deemed submitted or approved prior to June 2, 1980 which is identified by the Director, on the basis of the criteria, as having the potential to significantly affect the air quality of an onshore area of any State shall be required to submit the information specified in § 250.34-3(a)(4) or § 250.34-3(b)(4) and comply with the applicable requirements of § 250.57-1.

Many commenters argued that the regulations should not apply to activities covered under an approved exploration plan or development or production plan. Other commenters indicated their strong support for the revision of such plans but suggested that the language of the regulations be clarified to insure that there was no confusion on this issue.

In order to clarify the ambiguities of the proposed regulations and to respond to commenter's criticisms, §§ 250.57-1(a), (b) and (c) have been substantially revised. First, the reference to the filing of plans prior to the effective date of the regulations has been deleted. Instead, to be consistent with §§ 250.34-1(a)(6) and 250.34-2(b)(6), the term filing" has been deleted and the term "deemed submitted" has been added. The status of a plan is to be determined by the date that the plan is deemed submitted by the GS. Additionally, instead of referring to the "effective date of these regulations," the actual effective date--June 2, 1980--has been incorporated into the regulations.

The second major change from the proposed regulatory scheme concerns facilities described in development and production plans deemed submitted or approved prior to June 2, 1980, which have the potential to significantly affect onshore air quality. The overall goal of the Department's air quality program is to prevent significant onshore air quality effects from OCS facilities. Several major emission sources covered under development and production plans which have already received GS approval have not yet commenced operations. Also, the possibility exists that some plans which are deemed submitted before these regulations become effective may cover sources which have the potential to significantly affect the air quality of an onshore area. The release of emissions from these sources could result in substantial adverse onshore air quality effects. To avoid such effects, the regulations have been structured to give the Director the discretion to require that plans which were deemed submitted or approved by the GS prior to June 2, 1980 (existing facilities) be subject to the provisions of § 250.57-1 instead of § 250.57-2.

To determine whether such a facility should be treated as a new facility under § 250.57-1 or an existing facility under § 250.57-2, the Director will consider the size of the facility, the distance of the facility from shore, the number of sources planned for the facility and their operational status; and the air quality status of the onshore area. It is the intent of the Department that use of this discretionary authority will generally be restricted to those situations where a large emission source, which is part of a facility located rather close to a nonattainment area, has not yet commenced operations. For instance, it is possible that some facilities in the Santa Barbara Channel and possibly in other OCS areas off California will be subject to review under this provision.

It should be noted that the discretion created under this section is sufficient to allow the Director to review any existing facility, regardless of the operational status of the sources on the facility, if the Director has reason to believe, after evaluation of the facility according to the criteria set out in § 250.57-1(b)(1), that the facility may be significantly affecting the air quality of an onshore area. However, we believe that the Director will rarely have reason to exercise the authority under § 250.57-1(b) for existing facilities on which most or all of the sources are operating. Such existing facilities will, however, be subject to State review as described in § 250.57-2.

Section 250.57-1(d) establishes the formulas to be used in determining whether projected emissions from a facility are exempt from the regulatory program. For a detailed discussion of these provisions, see "Exemptions."

Section 250.57-1(e) identifies the "significance levels." For a discussion of this provision, see "Significance Levels."

Section 250.57-1(f) explains how significance determinations will be made for non-VOC pollutants and for VOC pollutants. For non-VOC pollutants, any emission which would result in an onshore ambient air concentration above the significance level for that pollutant is deemed to "significantly affect" the air quality of an onshore area. For VOC's, any emission in excess of the exemption level "E" is deemed to significantly affect the air quality of an onshore area. The rationale for choosing these levels and a discussion of the comments received on this issue are included in other sections of this preamble (see "Modeling", "Significance Levels" and "Volatile Organic Compounds.")

Section 250.57-1(g)(1) requires lessees to fully reduce any non-VOC pollutant which significantly affects a nonattainment area. This must be done through the application of BACT and, if additional reductions are necessary, through the application of additional emission controls or the acquisition of offshore or onshore offsets. A discussion of the comments received concerning the application of BACT and the offset requirements is included in another section of this preamble (see "Best Available Control Technology" and "Offsets").

Section 250.57-1(g)(2) requires lessees to apply BACT to control non-VOC emissions significantly affecting attainment or unclassifiable areas. Assuming the application of BACT, the lessee is then directed to model emissions to determine whether the emissions of TSP or SO_2 which remain after the application of BACT would cause the PSD maximum allowable increases (established in the Clean Air Act) to be exceeded. If the increases are exceeded, the lessee must apply additional emission controls or obtain offsets so that the concentrations of TSP and SO_2 in the onshore ambient air of an attainment area do not exceed the maximum allowable increases.

The reference to the EPA regulations (40 CFR 52.21(d) and (f)), which appeared in the proposed regulations, has been deleted. The provisions of 40 CFR 52.21(f) apply to onshore areas and are independent of OCS operations. However, the provision of 40 CFR 52.21(d) has been retained and incorporated into the regulations.

Section 250.57-1(g)(3) provides that VOC emissions, except those from a temporary facility, which significantly affect a non-attainment area shall be fully reduced. The lessee must apply BACT to the facility and, if further reductions are necessary, the lessee must apply additional controls or obtain onshore or offshore offsets. This section also requires that VOC emissions which significantly affect an attainment area be reduced through the application of BACT. For a detailed discussion of these decisions, see "Volatile Organic Compounds."

A new § 250.57-1(g)(4) has been added which provides that, in those instances when emissions from a facility significantly affect both a nonattainment and an attainment or unclassifiable area, the regulatory requirements applicable to emissions significantly affecting a nonattainment area shall apply. This section also includes a requirement that in those instances when emissions from a facility significantly affect more than one class of attaiment area, the lessee must reduce emissions to meet the maximum allowable increases specified for each class. For example, if emissions from a facility simultaneously impact both Class I and Class II areas, the emissions must be reduced to the point where the maximum allowable increases are not exceeded in either area.

Section 250.57-1(h) contains the provisions which apply to temporary facilities. Under this section lessees must apply the best available control technology to reduce emissions from temporary facilities which significantly affect the air quality of a State. For a discussion of the comments received on this issue, see "Temporary Facilities."

Section 250.57-1(i) sets forth certain requirements for emission offsets. In order to obtain approval of a proposed emission offset, the lessee must demonstrate that: (1) The offsets are equivalent in nature and quantity to the emissions that must be reduced; (2) a binding commitment exists between the lessee and the owner of each offsetting source; (3) the appropriate air quality control jurisdiction has been notified of the need to revise the State Implementation Plan to include the information regarding the offsets; and (4) the required offsets come from sources which affect the air quality of the area significantly affected by the lessee's OCS operations. One commenter recommended dropping the provision requiring offsets "equivalent in nature and quantity to the emissions that must be reduced." Instead, the commenter suggested that the amount of the offset required should be limited to the equivalent of the onshore impact of the emission. Another commenter argued that the requirement that the lessee obtain binding commitments be eliminated because such a requirement could lead to delays and uncertainties and because changes at the offsetting source could adversely affect the binding commitment. Both the "equivalency" requirement and the binding commitment requirement have been retained in the final regulations. The "equivalency" requirement is the same as EPA's and is necessary to insure the effectiveness of the offsets. The Department agrees that, in some instances, a change in status of the offsetting source which affects the binding commitment could occur, but believes that such a contingency can be addressed easily in the document creating the commitment.

Many comments were received on the question of whether the regulations should require that all existing onshore or offshore sources owned and operated by the lessee be in compliance with all Clean Air Act requirements as a condition to operating on the OCS. Most commenters believed that the Secretary has no authority under the Act to impose such a requirement and that such action would result in a total bar of OCS activities. One commenter, however, took the position that the cross-compliance requirement is necessary. Since onshore violations of the Clean Air Act already are subject to a variety of enforcement actions and these actions are outside the Department's jurisdiction and control, the Department believes that it is unnecessary to impose this additional condition to OCS development. Accordingly, no cross-compliance requirement has been incorporated into the final regulations.

A new § 250.57-1(j), which is similar to a provision appearing at § 250.57-1(c) of the proposed regulations, has been added. It provides that if a State demonstrates to the Director that emissions from an exempt OCS facility will, either individually or in combination with emissions from other OCS facilities, significantly affect the air quality of an onshore area, or the Director believes that an otherwise exempt facility may cause onshore significant effects, the Director may require the lessee to submit additional information to determine whether control measures are necessary. The Director will provide the lessee involved an opportunity to comment on the State's information.

Several commenters argued that this provision constitutes an impermissible delegation of authority to States. Other commenters suggested that lessees should have the opportunity to rebut information supplied by the State to demonstrate that emissions from exempt facilities are not resulting in significant onshore impacts. Others suggested that if States are allowed to intervene they must be required to carry a heavy burden of proof and provide substantial technical evidence to support their position.

It is the Department's position that the provision giving the States the opportunity to present information about the impact of otherwise exempt emissions is not a delegation of authority because the final decision concerning onshore impacts remains with the Director, not the States. However, the Department has incorporated language allowing the lessee to respond to the presentation provided by a State before the Director makes a decision concerning the necessity for the submission of further information by the lessee.

Section 250.57-1(k) is a new provision which requires the lessee to monitor, in a manner approved or prescribed by the Director, emissions from a facility. This information is to be provided in a manner and form approved or prescribed by the Director and to be included in the monthly report of operations required under 30 CFR 250.93.

The proposed regulations contained no monitoring requirements. Several commenters noted the absence of the requirement and urged that both preconstruction site-specific data and post-construction monitoring data be required to validate the analysis and the modeling. Other commenters argued that monitoring should be required only where emissions cannot be adequately estimated. These commenters were concerned with the costs and need for monitoring.

The Department must have a means of insuring that the actual emissions from a facility are the same as the projected emissions contained in the plan. This type of verification is essential for effective enforcement and to assure coastal areas that emissions from offshore facilities are not significantly affecting their air quality. Thus, the final regulations impose a post-construction monitoring requirement on any lessee that has installed emission controls. The Director must approve the form and manner in which the monitoring is to be performed. The Department expects that these requirements will vary from case to case.

Section 250.57-1(l) is a new provision under which the Director may require lessees to collect, for a period of time and in a manner approved or prescribed by the Director, and submit meteorological data from the facility.

The proposed regulations contained no requirements for the collection of meterological data by lessees. Some commenters urged that site-specific data be required as a pre-requisite to approval of a facility. It also was argued that pre-construction collection of meteorological data would be virtually impossible. Others pointed out that until the platform is constructed, the collection of meteorological data would be extremely costly.

The Department believes that onsite monitoring of meteorological conditions is not economically feasible prior to the construction of a structure on the lease area. However, once a structure is in place, the Director may impose a requirement that meteorological data be collected and reported for a specified period of time.

4. Section 250.57-2 Existing Facilities

Under the final regulations, an existing facility is defined as an OCS facility described in a plan deemed submitted prior to June 2, 1980, except for a facility identified for review by the Director under § 250.57-1(b). Operators of existing facilities are not required automatically to submit information regarding emissions. However, the Director may require the submission of this information under § 250.57-1(b) (see discussion under "Facilities Described in a New or Revised Exploration Plan or Development and Production Plan"). Additionally, a State may trigger a review of an existing facility under § 250.57-2. An affected State may request that the Director supply basic emission data from existing facilities when the data are needed for the updating of the State's emission inventory. In submitting the request, the State must demonstrate that any similar onshore or offshore facilities under the State jurisdiction are included in the State's emission inventory. After the submission of this request by the State, the Director may require lessees of existing facilities to submit the basic emission data to the requesting State. The State then is given the opportunity to submit information to the Director which indicates that emissions from existing facilities may be significantly affecting the air quality of the State.

The Director will evaluate the information submitted by the State and will provide the lessees involved an opportunity to comment on the State's information. The Director will then evaluate all information. If the Director determines that no existing facility has the potential to significantly affect the air quality of the State submitting the information, the Director shall notify the State of this finding and explain the basis for this determination. If the Director determines that a facility has the potential to significantly affect the air quality of the State submitting the information, the Director shall require the lessee of the facility to submit within 120 days, or a longer period of time if the Director determines it is needed, information required to make findings concerning the impacts on onshore air quality impacts.

In submitting such information, the lessee shall apply the same exemption levels and significance criteria as are applicable to new facilities. If, under these criteria, any non-VOC or VOC emission is determined to significantly affect any onshore area, then the lessee is required to reduce the emissions through the application of BACT. The Department does not intend that an existing facility must shutdown if it is determined to significantly affect an onshore area. Instead a compliance schedule for the application of BACT must be submitted to the Director. The Director will monitor the progress of the lessee to insure adherence to the compliance schedule. If it is neccesary to cease operations to allow for the installation of emission controls, the lessee may apply for a suspension of operations under the provisions of 30 CFR 250.12.

Some commenters suggested that, if the Department declined to create an exemption for existing facilities, the BACT requirement should only apply to those facilities affecting nonattainment areas. They recommended eliminating any control requirements when attainment or unclassifiable areas would be impacted. For a discussion of the Department's rejection of this suggestion, see "Prevention of Significant Deterioration."

One commenter argued that the regulations should set out the requirements a State must meet to activate the review process for existing facilities. The final regulations do not set forth a comprehensive list of requirements a State must meet. However, they do require that before a State can request basic emissions data from the Director, it must submit information demonstrating that similar onshore or offshore facilities within the State's jurisdiction also are included in the State's emissions inventory.

Another reviewer suggested that provisions be added which describe the criteria the Director will apply in determining whether existing facilities have the potential to significantly affect an onshore area. The final regulation states that the Director will base this decision on information available on the facilities themselves (i.e. basic emissions data), meteorological data, and the distance of the facility from shore. The Department cannot be more specific about these factors because they will vary from area to area.

Finally, one commenter suggested that the 120-day provision for revision of the plan should be deleted. The requirement has not been deleted, but a provision has been added which allows the Director to extend the 120-day period whenever necessary.

The regulatory procedure described in this final rule for existing facilities is essentially the same as the one in the proposed regulations. The major change involves the States' ability to request the submission of basic emission data. For a more detailed discussion of the comments received on provisions relating to existing facilities, see "Existing Facilities"

OVERVIEW OF THE REGULATORY PROGRAM

The final regulations are designed to insure that emissions from OCS-facilities do not cause significant effects on the onshore air quality of a State. The program is divided into three steps for each air pollutant. The first two steps are screening procedures to determine whether emissions of an air pollutant from an

OCS facility would significantly affect the onshore air quality of a State. The third step, if necessary, determines what measures the lessee must take to mitigate the impact of the emissions of the air pollutant. These steps are illustrated in Figure 1.

Step 1: Do the emissions of an air pollutant exceed the exemption amount "E"?

The projected emissions of an air pollutant from each facility are calculated and compared to an emission exemption amount "E". The emission exemption amount "E" is dependent upon the distance of the facility from shore and is calculated for each air pollutant on the basis of formulas described in the regulations. If the projected emissions from the facility are equal to or less then "E", the facility is exempt from further air quality review for that air pollutant and the information required from the lessee is limited to projected emission and distance data and an explanation of how the exemption formulas were applied. (For exploration plans see § 250.34-3(a)(4)(ii)(A), for development and production plans see § 250.34-(3)(b)(4)(ii)(A).

Step 2: Do the emissions of an air pollutant cause onshore air pollutant concentrations to exceed the significance levels established in the regulations?

If a facility is not exempt under Step 1 because the emissions of an air pollutant from the facility exceed the emission exemption amount "E", the lessee must determine whether the emissions cause onshore pollutant concentrations above the "significance levels" established in the regulations.

For non-VOC emissions of TSP, SO_2, NO_2, and CO which exceed the emission exemption amount "E", the lessee must determine the onshore concentrations by air pollutant that will be caused by the offshore emissions. This is done through the application of models approved by GS. The resulting onshore concentration of these pollutants is then compared to the significance levels established in the regulations. If the emissions result in onshore concentrations below the significance level for that pollutant, the facility is not subject to further regulatory review for that pollutant and the information submitted by the lessee need include only the projected emission and distance data, and the information related to the meteorological data and models used. (For exploration plans see § 250.34-3(a)(4)(ii)(A) and (B); for development and production plans see § 250.34-3(b)(4)(ii)(A) and (B).

A VOC emission which exceeds the emission exemption amount "E" is deemed to significantly affect an onshore area of the State.

Step 3: What degree of control is necessary?

Lessees must control the emissions of those air pollutants which are not "screened out" of the regulatory scheme under either Step 1 or Step 2. The degree of control imposed depends on the air quality status of the nearby onshore area and the nature of the pollutant. The control requirements are summarized as follows:

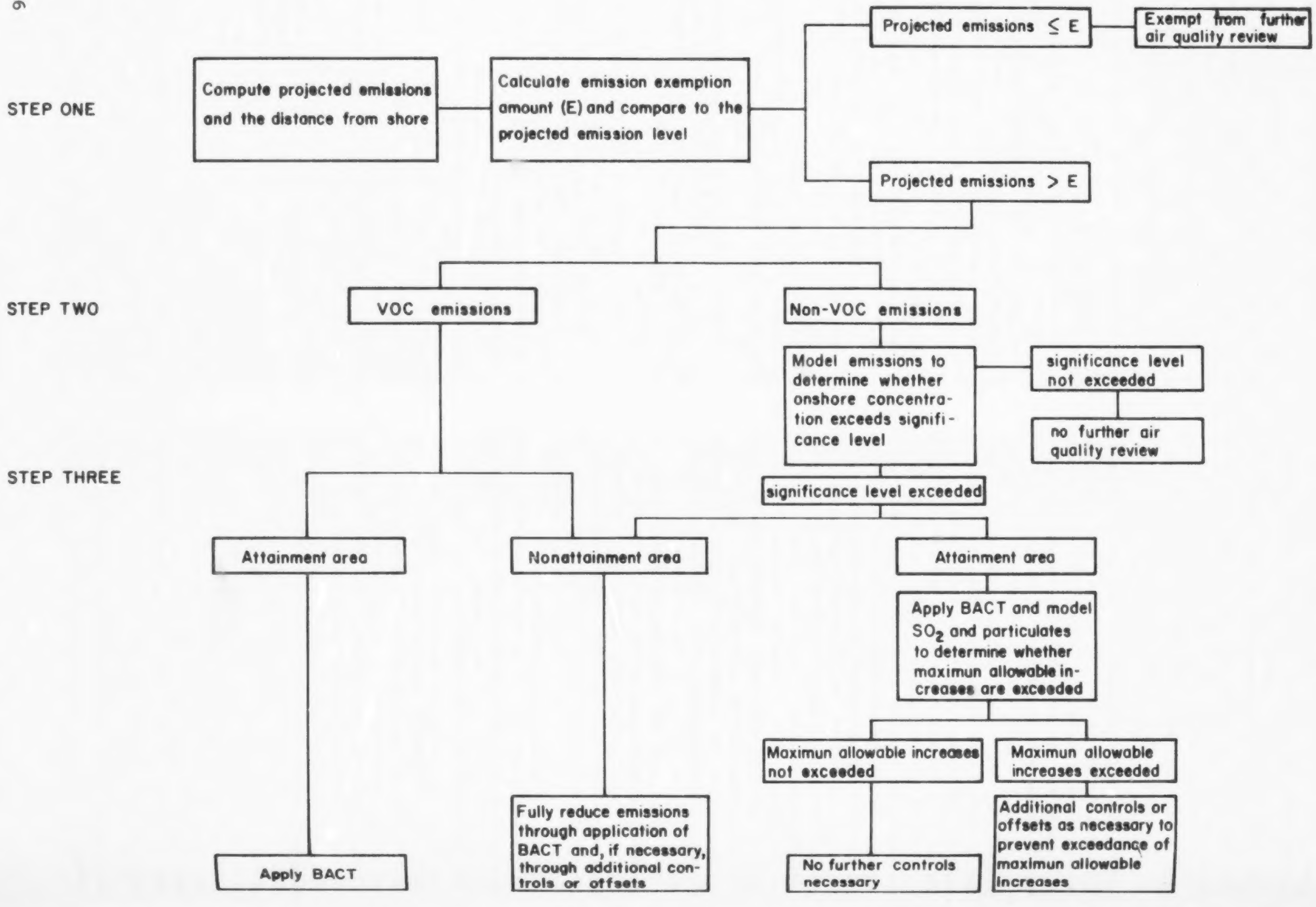
Emission
Controls Required
Non-VOC emissions:
1. Affecting a nonattainment area
    BACT + additional controls or offsets necessary to "fully reduce" emissions
2. Affecting an attainment area
    BACT + additional controls or offsets necessary to prevent exceedance of maximum allowable increases for SO_2 and TSP.
VOC emissions:
1. Affecting a nonattainment area
    BACT + additional controls or offsets necessary to "fully reduce" emissions
2. Affecting an attainment area
    BACT
Non-VOC or VOC emissions:
1. From a temporary facility affecting an attainment or a nonattainment area
    BACT
2. From an existing facility affecting an attainment or a nonattainment area (except if designated by the Director to be treated as a facility described in a new plan)
    BACT

A lessee proposing a facility which is subject to any of these control requirements must submit all information reqired by § 250.34-3(a)(4)(ii)(A) through (D) for exploration plans or § 250.34-3(b)(4)(ii)(A) through (D) for development and production plans. This includes information about projected emission and distance from shore, the meteorological data and models used and the modeling results, the air quality status of the onshore area, and the emission reduction control technologies to be used to reduce emissions.

This regulatory scheme is applicable to any newly proposed facility or to any proposed modification of a facility. It also is to be applied to any existing facility which the Director identifies under § 250.57-1(b) as a facility with the potential to significantly affect the onshore air quality of any State. Additionally, the information requirements and procedures described in Steps 1 and 2 for determining significance are to be followed where the Director, at a State's request, requires the submission of information pursuant to § 250.57-2 for an existing facility. The emissions control requirement for existing facilities is limited to the installation of BACT.

Decisions concerning the potential impacts on onshore air quality of emissions from OCS facil-

FIGURE 1: AIR REGULATORY SCHEME FOR OCS FACILITIES


STEP ONE
STEP TWO
STEP THREE
Compute projected emissions and the distance from shore
Calculate emission exemption amount (E) and compare to the projected emission level
Projected emissions ≤ E
Exempt from further air quality review
Projected emissions > E
VOC emissions
Non-VOC emissions
Model emissions to determine whether onshore concentration exceeds significance level
significance level not exceeded
no further air quality review
significance level exceeded
Attainment area
Nonattainment area
Attainment area
Apply BACT and model SO_2 and particulates to determine whether maximun allowable increases are exceeded
Maximun allowable increases not exceeded
Maximun allowable increases exceeded
Apply BACT
Fully reduce emissions through application of BACT and, if necessary, through additional controls or offsets
No further controls necessary
Additional controls or offsets as necessary to prevent exceedance of maximun allowable increases

ities and the necessity for control or offset of those emissions will be made as part of the approval process for exploration plans and development and production plans (see Sections 11 and 25 of the Act). As part of its review of the plan the GS will evaluate the information submitted by the lessee. State and local governments will have an opportunity to review and comment on the information in accordance with the procedures described in 30 CFR 250.34. The exploration plan or development and production plan will not be approved until the GS is satisfied that the air emission data are accurate, that the air models have been run in accordance with relevant guidelines, and that, where applicable, the controls and other mitigating measures proposed are adequate and available.

Because the Survey has integrated the air quality regulations into its established regulatory scheme, no separate permit issuing procedure is necessary. A lessee can undertake no exploratory, development or production activities on a lease until the applicable plan is approved and required drilling permits are granted. Additionally, at any time after approval of a plan the Department has authority to suspend operations under 30 CFR 250.12 if the lessee deviates from the approved plan. If, for instance, a lessee fails to honor a commitment to obtain an offset, or to take some other action to prevent or mitigate the effects of emissions from operations under an approved plan, operations can be suspended until the problem is remedied. The lessee also may be assessed substantial monetary penalties for failure to conduct activities on the OCS in accordance with the approved plan.

ENVIRONMENTAL IMPACT AND REGULATORY ANALYSIS

The Department of the Interior has determined that the revision of the regulations in 30 CFR Part 250, in accordance with this notice, is not a major Federal action significantly affecting the quality of the human environment and will not require preparation of an Environmental Impact Statement. The Department has also determined that this notice of final rule is a significant rule but does not require preparation of a regulatory analysis under Executive Order 12044 and implementing regulations 43 CFR Part 2.

CECIL D. ANDRUS,
Secretary of the Interior

FEBRUARY 29, 1980

APPENDIX C
Alternative Energy

ALTERNATIVE ENERGY

A. INTRODUCTION

Oil and gas are currently the nation's primary energy sources (see Table A-1). Even with vigorous conservation the United States demand for energy will continue to grow. The United States will need increased domestic energy production if it is to avoid shortages and unacceptable levels of imports. The United States based upon limited reserves of oil and gas, coal, oil shale, etc., eventually will make extensive use of non-conventional forms of alternative energy (solar, wind, etc.). However, during the remainder of the century the bulk of its energy supply will need to be provided by more conventional sources (oil and gas, coal, nuclear, and hydroelectric).

The oil and gas that would become available as a result of the Proposed 5-Year Oil and Gas Lease Sale Schedule would add significantly to national domestic production. If this proposal is delayed, or eliminated, in part or in whole, it would reduce future OCS oil and gas production. With the lack of input of OCS oil and gas into the national energy reserves, it could necessiate the increased production of energy from the other conventional and non-conventional energy sources.

The following discussion is a brief summary of various alternative energy sources which may be used to offset OCS oil and gas production.

B. COAL

Coal is a combustible rock which contains more than 50 percent by weight and 70 percent by volume of carbonaceous material from the accumulation, and physical and chemical alteration of vegetation. Classification of coal is based upon chemical analysis and certain physical reactions that measures the progress response of coal to heat and/or pressure. The analysis involves the determination of four constitutents 1) moisture, 2) mineral impurity (ash) 3) volatile material (gas/vapor) and 4) fixed carbon (solid residue after the removal of the gases). Based upon these constituents coal is ranked from low-ranked lignite through subbituminous and bituminous coal to high-ranked antracite and meta-antracite. Ninetyseven percent of the U.S. coal reserves are either bituminous (66 percent) or subbitumimous (31 percent) with the remaining coal being anthracite.

Most of the bituminous coal produced in the United States is burned to obtain thermal energy for generating electricity processing raw or manufactured material and heating industrial complexes (see Tables B-1 and B-2). Other uses include gasification and liquefaction (see Section B.1 and B.2).

It has been estimated (see Table B-3) that the total coal resource based for the United States is about 3 trillion tons. The Federal government manages about 60 percent of the coal resources within Colorado, Montana, New Mexico, North Dakota, Utah and Wyoming. At the close of fiscal year 1983, 18 competitive and non-competitive coal leases were issued covering 22, 108 acres. As of September 30, 1982, 691 coal leases covering 1,288,310

TABLE A-1
Production of Energy by Source
Quadrillion (10^{15}) Btu

	1979	1980	1981	1982	1983	1984
Coal	17.549	18.600	18.379	18.641	17.252	19.696
Crude Oil[1]	18.104	18.249	18.146	18.309	18.369	18.590
NGPL[2]	2.286	2.254	2.307	2.191	2.367	2.367
Natural Gas (Dry)	20.076	19.907	19.699	18.255	16.530	17.750
Hydroelectric[3]	2.931	2.900	2.758	3.256	3.502	3.386
Nuclear Electric	2.776	2.739	3.008	3.131	3.203	3.546
Other[4]	0.089	0.114	0.127	0.108	0.133	0.174
Total	63.811	64.764	64.424	63.892	61.196	65.508

Source: DOE, February 1985 Monthly Energy Review, December 1984.

1. Includes lease condensate.
2. Natural Gas Plant Liquid (NGPL).
3. Includes industrial and utility production of hydropower.
4. Includes only geothermal power and electricity produced from wood, waste and wind.

TABLE A-2

CONVERSION FACTORS

Energy Form	Energy Content (Btu)
Petroleum, barrel	5.8×10^6
Natural gas, ft^3	1,025
Coal, metric ton	27.8×10^6
Coal:	
Anthracite, short ton	26.4×10^6
Bituminous, short ton	26×10^6
Subbituminous, short ton	20×10^6
Lignite, short ton	14×10^6
Hydroelectric, KWH	10×10^3
Nuclear Power, KWH	10×10^3
Uranium, short ton U_3O_8	40×10^{10}

ROUGH EQUIVALENCES FOR U.S. ENERGY DATA

1 Quadrillion Btu = 500,000 barrels petroleum per day for a year
= 40 million tons of bituminous coal
= 1 trillion cubic feet of natural gas
= 100 billion KWH (based on a 10,000-Btu/kwh heat rate)

Source: DOI, 1976

TABLE B-1
Coal Consumption by End Use Sector
(thousand short tons)

Year	Electric Utilities	Coke Plants	Other Industrial	Residential & Commercial
1980	569,274	66,657	60,347	6,451
1981	596,797	61,014	67,395	7,421
1982	593,666	40,908	64,097	8,240
1983	625,211	37,033	65,980	8,448

Source: DOE, March 1984 Monthly Energy Review

Table B-2
Coal Overview
(thousand short tons)

Year	Production	Consumption	Imports	Exports
1980	829,700	702,729	1,194	91,742
1981	823,775	732,627	1,043	112,541
1982	838,112	706,911	742	106,277
1983	784,865	736,672	1,271	77,772

Source: DOE, March 1984 Monthly Energy Review

Table B-3
Coal Reserves of the Major Coal Provinces in the United States

Province	Approximate reserves estimate (in millions of tons) Proven (with 0-3,000 ft. cover)	Total
Appalachian	286,907	382,485
Eastern Interior	194,740	317,240
Western Interior	59,981	133,209
Rocky Mountains	176,444	598,444
Great Plains	695,122	1,458,122
Pacific Coast	136,604	316,704
Gulf Coast	7,248+	7,248+
	1,554,046	3,213,452

Source: Spackman, 1973

acres are active (USDI, 1984). Table B-4 presents estimated 1983 production of coal in the United States.

The coal industry is expected to show a slight recovery in 1984 after a series of set backs due to the recession and falling export market. Coal forecasters are predicting (Coal Age, February 1984) an increase in demand for coal from the utilites and the steel industry. Coal Age reports that the average among predictions by the major coal forecasters call for consumption of 835.1 million tons in 1984, an increase of 4 percent over 1983. The average of production forcasted is 830 million tons, an increase of 6.4 percent over last year's output.

Numerous environmental impacts can result from the mining and the combustion of coal. Coal can be mined by two methods surface or underground mining. Production of coal by surface methods is amounting to almost 50 percent of the total coal output. Surface mining can result in impacts to air, land, and water by creating conditions that promote water and wind erosion, the distruction of topsoil, elimination of vegetation, and contamination of soil and water from weathering of toxic strata.

According to Office of Surface Mining (1980) Final Environmental Statement, surface mining of coal completely eliminates existing vegetation, destroys the genetic soil profile, displaces or destroys wildlife and wildlife habitat, degrades air quality in the area, alters the current land uses, and to some extent changes the general topography of the area being mined. Without diligent reclamation, surface mined lands are often unsuitable for other uses.

Department of Energy's (DOE's) (1979) Environmental Development Plan on Coal Extraction and Preparation reports that significant water quality degradation from former mining, with severe impacts on aquatic ecosystems. These streams and reserviors (primarily in the East) have been affected by sedimentation from surface mines, acid mine drainage, and erosion of spoil piles from mining and coal cleaning and preparation.

Surface mining impacts on ground water include: 1) drainage of usable water from shallow aquifers 2) lowering of the water table in adjacent areas, and changes in flow direction within aquifers 3) contamination of aquifers below mine operations from leakage of poor quality mine waters and 4) increased infiltration of precipitation on spoil piles. The removal of overburden improperly can cause the loss of topsoil, exposure of the parent material, and create vaste wastelands. The stock piling of the top soil from the area can destroy or alter many of the natural soil characteristics.

DOE's (1979) EIS points out that surface mining of coal causes indirect and direct impacts to wildlife steming primarily from disturbing, the removal and redistribution of the land surface. The area being surface mined (pit) and associated stock piles are not capable of providing food or cover for wildlife. Without proper rehabilitation the area must go through a weathering period and may require a few years to several decades before vegetation is establised. Broad and long lasting impacts to the wildlife within the area can occur from this imparement of the habitat.

TABLE B-4

Estimated 1983 Production Bituminous and Lignite Coal by States
(thousands of tons)

	Strip	Deep	Total
Alaska	826	----	826
Alabama	12,528	9,942	22,470
Arizona	11,506	----	11,506
Arkansas	28	----	28
Colorado	11,2000	5,300	16,500
Georgia	1	----	1
Illinois	25,410	34,420	59,830
Indiana	30,000	852	30,852
Iowa	398	----	398
Kansas	914	----	914
Kentucky	70,504	69,246	139,750
Maryland	1,472	1,470	2,942
Missouri	5,331	----	5,331
Montana	29,477	----	29,447
New Mexico	20,395	800	21,195
North Dakota	18,471	----	18,471
Ohio	20,870	11,240	32,110
Oklahoma	4,705	----	4,705
Pennsylvania	28,064	35,494	63,558
Tennessee	2,113	4,650	6,763
Texas	37,779	----	37,779
Utah	----	14,000	14,000
Virginia	7,000	28,000	35,000
Washington	4,120	----	4,120
West Virginia	28,000	84,000	112,000
Wyoming	108,292	1,320	109,612
Total	479,404	3000,734	780,138
	Anthracite, U.S.A		
Pennsylvania	2,314	424	4,236

Source: Coal Age, February, 1984

Coal cleaning also has land use impacts. Although the amount of land required for the disposal of coal cleaning wastes varies with coal extraction techniques and characteristics, national estimates range from 0.3 to 0.9 acres used per million tons of coal cleaned.

Underground mining of coal has the potential to result in subsidence, dropping of the water table, or interception of the surface water drainages.

Subsidence is probable in most undeground coal mining. Depending upon the degree of extraction, subsidence may be immediate or at some future time. Subsidence may disrupt aquifers, damage surface facilities, trigger mud slides or rock falls. In some cases subsidence can lead to permanent loss of coal resources.

Other major concern associated with underground mining is caused by the large quantities of explosive methane within coal seams and in the adjacent strata.

The major concerns with both surface and underground mining is the health and safety of the mine workers. Safety and health hazards to the workers especially in underground mining are the highest of any industry. Additional discussion on impacts associated with coal development can be found in: Department of Interior, 1974, Final Environemtnal Impact Statement Proposed Federal Coal Leasing Program.

C. SYNTHETIC FUELS

The synthetic fuel development has slowed down due to the sagging price of crude oil due to the world surplus. Oil price moderation, soaring costs, and lack of Federal assistance has led operators throughout the U.S. to shelve, delay or abandon commercial synfuel ventures. Some operators have kept their projects in order to alleviate future depression of fossil fuels.

The techniques for the conversion of coal to gas and liquid hydrocarbons are very old. Only two basic steps are involved the breaking, or "cracking" of heavy hydrocarbon molecules into lighter molecules and the simultaneous enrichment of the molecules with hydrogen.

1. Coal Gasification

The coal gasification process uses coal to produce gaseous fuel products that can be directly combusted in a boiler, used as chemical feedstock or used as an intermediate product that can be converted into liquid fuels (See C.2 direct and indirect coal liquification).

Depending upon the process configuration and operating parameters the basic types of gasification processes are capable of producing either low-Btu gas (less than 200 Btu per standard cubic foot) or medium Btu gas (200 - 500 Btu per standard cubic foot). The medium Btu gas can then be upgraded to methane in a reaction to produce high Btu gas (900 to 1000 Btu per standard cubic foot).

Three ingredients are required to synthesize gas chemically from coal: carbon, hydrogen, and oxygen. This is performed by reacting coal under sufficient heat with steam and air. Several types of gasifiers are commercially available for the production of low and medium Btu gas (Koppers - Tetzek Winkler, and Lurgi, etc.). A detailed discussion on the chemical and design considerations, as well as, a process description can be found in: Energy Research and Development Administration 1977, Environmental, Health, and Control Aspects of Coal Conversion: An Information Overview, ed: by H. M. Braunstein, E. D. Copenhasier, and H. A. Pfuderer Contract No. W-7405-ENG-26.

2. Gas Liquefaction

Indirect liquefaction processes are those which conversion of coal to liquid products is accomplished by first gasifying coal to a mixture of carbon monoxide and hydrogen (synthesis gas) and then allowing these gases to react in the presence of a catalyst to form liquid products. In direct liquefaction process a coal slurry is reacted directly with hydrogen in the presence of a catalyst hence, the intermediate step in the in direct liquefaction process is thus eleminated. After hydrogeneration, the solids and liquids are separated. The residual solids are then burned in a gasifier to generate hydrogen and steam. The quality of the liquid can be either a boiler fuel grade or synthetic crude grade.

Coal gasification seems to be the leading commercial scale synfuel project throughout the world. In the United States in 1981 only 30 coal-to-synthetic projects were in operation. Of these, only eight are commercial operations. The remainder are demonstration pilot or for process development.

The Fisher-Tropsch process which converts synthesis gas to liquid product has been operating in South Africa's Sasol plants using a commercial gasifier (Lurgi). These three facilities convert coal mined on site into 27 different fuel and chemical products. The combined coal consumption of all three plants will be about 33 million metric tons per year. It is predicted Sosal Ltd. could produce sufficient quantities of hydrocarbon to make South Africa self sufficient (E&MJ, November, 1982).

The state-of-the-art gasifier available for use of the highly caking eastern bituminous coal and other coals is an atmospheric Koppers-Totzek unit. The most advanced gasifier is the presurized Texaco gasifier. Four major direct liquefaction processes are under development Solvent Refined Coal SRC I and SCR II, H-Coal, and Donor Solvent.

Processes that are under development or are at preliminary demonstration scale plants include staging Lurgi, COGAS, U-gas and Texaco.

For impacts associated with the mining of coal to supply the coal gasification or liquefaction plants see Section B.

DOE's (1980) EIS Synthetic Fuels and the Environment - An Environmental and Regulatory Impact Analysis reports that substantial quantities of solid waste material will be generated in each stage of the coal conversion process. Waste material will be generated directly from the process which is part of the original feed, such as ash, unreacted carbon in the form of chars and tars, and fly ash from auxiliary boilers. Secondary wastes consisting of added materials/chemicals such as catalysts or coal conditioners, lime from scrubbers, and added reactants from water treatment.

There is concern for the health and safety for the workers since many hazardous and toxic substances are formed and used in the synfuel process. Many are identified carcinogenic materials which can form in coal conversion eg. benzo(A)pyrene, dibenz(a,h)anthracene, chrysene, and 7-methylbenz(c)-acridine as well as aromatic amines (eg. nophthylamine and benzidine) (DOE, 1980).

Air quality emissions from coal conversion facilities can include sulfur oxides, particulate matter, nitrogen oxides, hydrocarbons, hydrogen sulfides, ammonia, hydrogen cyanide, polynuclear aromatics hydrocarbons, nitrogen and sulfur containing heterocyclic compounds, and trace elements. Appropriate use of existing available technology should control source emissions to levels in compliance with applicable current regulations.

Waste water will result from numerous sources within the process. Standard treatment systems using flocculation and biodegestion should prevent water quality problems.

D. OIL SHALE

Oil shale is a fine-grained, sedimentary rock containing material called kerogen. Kerogen is of high molecular weight and has low solubility in any solvent. The only practical method of recovering hydrocarbons from the oil shale is by heating the rock to high temperatures (approximately 500°C) and thereby recovering shale oil and hydrocarbon gases.

There are two methods for surface retorting of oil shale: the direct- and indirect-heat methods. In both cases, heat is required to bring about pyrolysis of the raw shale. In the direct-heated process the heat is supplied by the creation of a combustion zone within the retort. In the indirect-heated processes, gases are circulated to an external reactor for combustion. Heat is transferred back to the retort by recirculating gases or solids through the retort and the external reactor.

The modified in situ oil shale process involves mining or removing up to 30 percent of the shale from the retort zone so that void volume is created and permeability increased. The remaining oil shale in the retort is then explosively fractured and retorted in place. In the case of leached shale, the shale is not fractured, hot gas is injected as the retorting medium. Retorting can then be accomplished by moving the retorted oil either hortizontally or vertically.

Three modified in situ processes are of current interest: 1) vertical modified in situ processing, 2) horizontal modified in situ processing preceded by mining or removing some of the shale, and 3) modified in situ processing preceded by solution mining of soluble salts.

The raw shale oil is then processed to remove water and other contaminants by a separation system that typically consists of a closed-cycle processing unit, such as impingement or centrifugal separators, or mechanical demisters.

The principal functions of the system are separation and recovery of oil or gaseous products from contaminants that include water produced in the retorting process as well as particulate material carried over the retort.

Following product recovery, crude shale oil requires further treatment to remove nitrogen, oxygen, and sulfur compounds and to reduce viscosity and pour points to allow pipeline or tanker transport. Removal of the nitrogen compounds requires a special refinery process.

Large areas of the western United States are known to contain oil shale deposits with those in the Green River Formation in Colorado, Wyoming, and Utah having the greatest commerical potential. The oil shale resources of the Green River Formation are estimated at 54 billion bbl of recoverable oil with an assay of 30 gallons per ton and 600 billion bbl of reserves in place from shale with an assay exceeding 25 gallons per ton. Therefore, the Green River Formation represents 20-30 times the known reserves of conventional crude oil in the United States.

Development in the oil shale industry within the United States (see Table D-1) is concentrated in Colorado's Piceance basin. The oil shale projects, in some cases, are funded or underwritten by DOE. Several of the projects are experiencing the effects of soaring costs and the saging oil prices and delayed development. Many of the companies are extending their timetables and reducing production goals.

In the eastern United States, the shale deposits underlie Indiana, Ohio, Illinois, Kentucky, Tennessee, Michigan, and Pennsylvania. The eastern shales are of a lower quality than the western shales, but the deposits are more extensive.

There is estimated that 1,000 billion bbl of recoverable reserves with the United States deposits. The 1,000 billion bbl figure is based upon hydrogen retorting rather than Fischer assay (International Petroleum Encycolpedia 1982). The eastern shale has a poor carbon-hydrogen ratio and is therefore required to retorted in the presence of hydrogen. In contrast, the Western shale requires only the application of heat to release the oil.

Air quality concerns relate to 1) the production of both criteria pollutants and 2) particulate matter and noncriteria pollutants associated with dust from mining and crushing of raw shale and resupension of disposed spent shale.

Control of particulates resulting from the production of oil shale can be a problem. For large surfaces at the mine, "wetting" or vegetation of the stock piles is an adequate control, whereas for more limited areas (e.g., conveyors, cruchers), baghouse filters, scrubbers, and cyclones are used to control particulate emissions. Fugitive emissions due to traffic, wind, etc., are a potential problem and may require the use of chemical additives and best control management practices.

Sulfur in raw oil shale amounts to about 0.7 percent by weight; either as organic sulfur or associated with iron pyrite. During retorting, about 40 percent of the organic sulfur in shale appears as H_2S in the produced gases, and the other 60 percent as heavier sulfur compounds in the raw

TABLE D-1

UNITED STATES OIL SHALE DEVELOPMENT

Sponsor	Location	Process	MMcfd	Feed,t/d	Status
Paraho Development Corp.	Bonanza, Utah	Surface retort	30,000	45,000	Slated onstream 1986; proposed cooperative agreement with DOE.
Colony Shale Oil	Grand Junction, Colo.	Surface retort	47,000	66,000	Engineering/design; scheduled onstream 1985.
Rio Blanco Oil Shale	Rangely, Colo.	Modified in situ, surface retort	50,000	----	Demo plant 2,000b/d; Lurgi surface retort under construction.
Superior Oil Co.	Rifle, Colo.	Surface retort	15,000	20,000	Proposed cooperative agreement with DOE.
Tosco	Parachute Creek, Colo.	Surface retort	48,300	----	Mid-1980's.
Union Oil Co. of CA	Parachute Creek, Colo.	Upflow retort modules	10,000	----	Onstream 1983, scale-up to 50,000 b/d by 1988.
Cathedral Bluffs (Occidental, Tenneco)	Rio Blanco Co., Colo.	Surface retort modified in situ	55,000	60,000	Engineering/design; 94,000 b/d by 1990; mine under construction.
Geokinetics	Vernal, Utah	In situ	20,000	----	Dev. unit onstream; scale-up 1983.
Chevron Oil Shale	Garfield County, Colo.	----	50,000	----	Demo plant 1982; scale-up by early 1990s.
Ramex Synfuels Int'l Inc.	Duchesne, Utah	In situ	----	----	Commercial plant by 1984.
Tosco Oil Shale	Vernal, Utah	Surface retort	50,000	60,000	Late 1980s.

Source: International Petroleum Encyclopedia, 1982 shale oil, spent shale, or water residuals. If shale oil or low-Btu gas from the retort is used for steam generation or any other combustion process sulfur oxides will be formed and flue gas desulfurization scrubbers will need to be used for tail-gas cleanup.

The kerogen fraction of the raw shale can contain up to 2 percent nitrogen. The extent of NO_x formation from the use of retort off-gases or shale oil to heat the retort will be related to flame temperature residence time and the air/fuel mixture. Combustion efficiency during oil shale retorting is not expected to be a significant problem. HC and CO emissions will therefore be small. The low-Btu gas formed during retorting will either be flared or used for onsite steam production with traditional flue-gas cleanup controls.

Water resource impacts encompass effluent control and water supply issues. In the semi-arid Piceance and Unita geological basins in Colorado and Utah, where most of the high quality oil shale resource is found, water pumped from mines or drawn for process use is expected to be recycled or consumed. Effluent problems are focused on potential contamination of aquifers and surface waters by leaching from spent shale piles, evaporative and lagoon concentrates, or from burned-out in situ retorts rather than direct emissions. Problems with in situ processes concerning backflood water and fugitive gas emissions may result in contamination of groundwater aquifers. Groundwater supplies and surface water supplies fed by groundwater aquifers might be affected for very long periods of time thereby creating difficulties in securing adequate water supplies for retort operation.

Wastewater from surface retorting operations (up to 8 gallons per ton of input shale and more from some in situ operations) and process water from product upgrading operations will have to be controlled. Water wastewate can then be used for moisturizing spent shale. Under current planning oil shale developers envision zero discharge of their wastewaters.

Disposal of spent shale and storage of raw shale could create land disturbances of large magnitude, potential accumulation of toxic substances in vegetation and contaminiation of groundwaters and surface waters from runoff.

DOE (1980) reports that retorted shale contains varying amounts of organic and inorganic residuals depending on the retorting process. It presents a major solid waste management and disposal problem for the surface and modified in situ operations from both the amount and its content. Retorted shale will have a density, after compaction, of about 75 to 100 lb/ft^3. This means every 50,000 barrels of suface retorted shale oil produced, there will be enough spent shale to occupy a volume of almost 2 million cubic feet, or about a 2-foot depth over a square mile every month of operation.

Above ground retorted shale from modified in situ operations would have condierably less solid waste for disposal. Large areas are required for the storage of raw shale and the disposal of retorted shale. The resulting potential loss of habitat for plant and animal communities and natural ersoion of the disposal piles by wind and water may not be fully mitigated by vegetating or physically stabilizing the disposal piles. Problems and uncertainites related to the vegetation of retorted shale include water requirements, accumulation of toxic trace substances in the vegetation, and long-term stability.

READEX FICHE pages tightly bound

Potential problems with stability of waste piles will require several years to emerage and uncertainities will remain for 10 to 20 years. Spent shale can either be returned to the mine or stockpiled above, in which case it will be compacted and vegetated or otherwise stabilized to prevent erosion by wind or water. Dust control will be accomplished by application of water or chemical wetting agents. Surface disposal options include filling valleys and recontouring surfaces. The major consideration is to ensure that the large quantities of spent shale can be economically disposed of with minimum environmental damage.

The occupational work force will be exposed to an environment largely uncharacterized in terms of industrial hygiene and safety analyses. The miners will be subject to exposure to possible toxic materials.

E. Biomass Conversion

Biomass conversion is the process of transforming biomass (organic material) into usable energy. Three methods of conversion are: 1) the conversion into liquid form (alcohol), 2) the conversion of organic wastes into methane gas by baterial breakdown; and 3) the direct burning of the source.

A biomass fueled gasification project which will convert peach pits into gas is planed for a greenhouse in Lodi, California. This is the first commerical application of an automated small-scale biomass fueled gasifier in California (California Energy Commission, 1984). The gas produced will be used to supply heat to greenhouses. The system will result in substantially reduced energy cost compared with the existing natural gas system. As a result the growers will be able to expand there growing seasons, increase plant yield, and expand their market to include high energy plants.

1. Ethanol and Methanol

Ethanol from grain is one of the alternative fuels that can be produced from a renewable resource. Ethanol can partially replace current transportation fuels derived from petroleum. Although ethanol can be produced from grain, 70 percent of the high-proof ethanol is made synthetically from ethylene gas derived from petroleum (DOE, 1980).

Ethanol may also be derived from any carbohydrate source, such as starch in corn and other grains. DOE (1980) reports that nearly 12 bilion gallons of ethanol would be required to produce a national 10 percent alcohol-gasoline blend by the year 2000. Assuming an average yield of 100 bushels per acre and an ethanol yield of 2.5 gallons per bushel, this amount of alcohol would require 48 million additional acres of corn production.

Methanol production is based upon the gasification of wood to produce a medium Btu gas followed by a chemical reaction to combine water and carbon monoxide to form hydrogen and carbon dioxide (see Section C). Additional carbon monoxide is combined catalytically with hydrogen to produce methanol.

Forest residue 1) "slash" cuttings left behind after conventional logging, and 2) stump/root systems can be used for the generation of methanol. A recent assessment has estimated that the forest industry waste (lumber and pulp mills) total about 23 million tons per (DOE, 1980). These wastes could serve as the major resource for methanol production.

Growing corn for ethanol production requires large amounts of nitrogen, in order to prevent nitrogen loss in the soil, rotation of crops with legumes, or the use of anhydrous ammonia would be required. The runoff and leaching of pesticide and fertilizer would accompany the increased grain cultivation. This can have an adverse effect on the ecosystem and possibly on humans.

The flow of sediments due to erosion, as well as the leaching of salts and could cause a wide variety of impacts on ecosystems and could cause reduction in land productivity.

Extensive production of methanol from siliviculture biomass resources may distrub up to 50 percent (350 million acres) of current forest land. Besides pollution impacts, this has the potential for severe ecosystem impacts, such as the elimination of the range of certain species, elimination of threatened and endanagered species and the elimination of specific system ecotypes.

Siliviculture biomass production and residue removal schemes have the potential to significantly increase air and water erosion of the soil. Erosion of the soil from cleared areas is fairly predictable and can be serious in areas of high rainfall and hilly topography.

Siliviculture for methanol production should not contribute to air pollution as dusting does in farming. For a plant that would process 2000 tons per day of green wood and produce 170,000 gallons per day of methanol. It has been estimated that 1000 tons per day of CO_2 is vented into the atmosphere (DOE, 1980).

When grain starch is converted to alcohol by means of hydrolysis and fermentation approximately equal weights of ethanol and carbon dioxide are formed in the process.

With the generation of methanol from wood using an estimate of 0.25 percent product loss to the air, 1.4 tons per day of hydrocarbons are estimated. The facility would also generate .44 tons per day of particulate emission from the grinding room.

Residual wastes (solids remaining after fermentation process) have been estimated for a 20 million gallon per day ethanol plant. The amount of raw waste might range from approximately 12 to 55 gallons per gallon of product. The waste may contain contaminents equivalent to 0.12 to 0.17 pounds of BOD_5 (5-day biochemical oxygen demand per gallon of ethanol product).

The main source of solid waste is biological growth associated with secondary treatment of the liquid waste previously mentioned.

Approximmately 0.5 pounds of excess activated sludge can be expected for each pound of BOD_5 removed. Assuming that the raw waste contains 0.17 lb of BOD_5 per gallon of product ethanol 95 percent removal corresponds to 961 tons BOD_5 removed per 10^{12} Btu produced. Excess waste will amount to 480 tons per 10^{12} Btu.

Solid waste from biomass farms for methane production should be minimal because optimum use of the yield should be the prime goal of biomass technology. However, sediment loading of waterways will result from conventional logging techniques.

For a 170,000 gallon per day methane plant with activited sludge treatment, it has been estimated that 0.64 ton per day of BOD_5 would be produced along with 6 tons per day of waste activated solids and 25 tons per day of ash and unburned carbon.

2. Urban Waste

The basis processes for converting urban waste to energy are combustion, pyrolysis, and bioconversion. Each process requires waste collection, and its transportation. Some processes require mechanical pre-proccesing to separate the municipal solid waste into a refuse derived fuel and other noncombustible and nonbiodegradable materials. Some of the noncombustible and nonbiodegradable materials such as ferrous metal, aluminum and glass are recycable.

Combustion of urban wastes in waterfall boilers is the most developed process, with eight plants commerically operating in U.S. cities. Urban waste furnaces are being demonstrated at a 600 ton per day facility in Milwaukee, Wisconsin, and a 200 ton per day unit has been undergoing test (jointly EPA and DOE sponsorship) with 50 percent refuse derived fuels at Ames, Iowa, since 1974.

Pyrolysis or thermal gasification processes have been listed in Charleston West Virginia, Baltimore, Maryland and El Cajon, California. Municipal solid waste is decomposed in an oxygen - deficient atmosphere to produce combustible gas and liquids scrubbing is used to remove hydrochloric acid, hydrogen sulfide, and SO_2. Wastewater is a byproduct requiring treatment.

The bioconversion process for converting solid and liquid urban wastes into methane, glucose, or ethyl- and methyl-alcohols are in the research and early pilot plant stages. The processes leave a waste disposal problem in the form of liquid digester residues, micoorganisms, and inorganic nonbiodegradable material. A DOE sponsored degestion plant at Pompano Beach, Florida and the ANFLOW project are currently producing methane.

Emmissions from combustion and co-combustion facilities are known to contain fly ash, organic compounds, and trace elements and are of concern from health and welfare stand point.

Effluents including disposal sites (pits, ponds, lagoons) are likely to contain the same ingredients that are present in raw municipal waste and may pose a hazard to water resources and ecosystems.

Waste conversion processes greatly reduce municipal solid waste volume but still leave waste residuals that go into landfills or impoundments. The chemical composition and source (domestic, industrial) of the municipal solid waste and with the process. Leachability of fly and bottom ash, pyrolysis byproducts, scrubber sludge, an the anaerobic degestion sludge is a concern. Selection of landfill sites and facility siting may be impacted.

Waste plant, front-end processing, storage, and transport operations may pose an occupational hazard to workers. Data indicate that dust, microorganisms, hazardous chemicals, and noise are all highest close to equipment for providing and storage of municiple solid waste.

The presence of combustible dust may create explosion hazards. These operations also expose the general public to aesthetic problems, dust, noise, odor which result in siting problems. Traffic flow in the vicinity of the plant is also a concern.

F. ONSHORE OIL AND GAS

The U.S. Geological Survey in 1981 estimated that onshore, undiscovered, recoverable oil resources ranged from 42 billion barrels of oil with a 95 percent probability and 71 billion barrels of oil with a 5 percent probability (mean - 55 BBO). Onshore natural gas resources range from 320 trillion cubic feet of gas (TCFG) with a 95 percent probability and 570 trillion cubic feet of gas with a 5 percent probability (mean - 430 TCFG).

The major areas for oil and gas activities (exploration and development) in the United States are within three regions: Rocky Mountain Region; Mid Continent; and the Eastern Overthrust Belt. According to the 1984 International Petroleum Encyclopedia 7,914 new field wildcats were completed during 1982; 1,402 wells were completed as producers for a success rate of 17.72 percent. That compares with 17.67 percent in 1981 and a record 19.05 percent in 1980. The 1,402 new field discoveries of 1982 represents a 1.5 percent decrease from 1981. AAPG estimated that 1982's new field discoveries contained reserves of 651.64 million bbl of oil and condensate and 3.84 trillion cubic feet of gas. That amounted to a decrease of 0.2 percent in liquids and 10.7 percent in gas from figures reported for 1981.

The environment can be affected by the three different phase of oil and gas activity: exploration, development, and production. Actions such as building of access roads and trails, plus clearing of sites for seismic testing, stratigraphic testing, and wildcat drilling may cause surface disturbances resulting in siltation of surface water, reduction in vegetation, and alteration of the visual character and wildlife habitat of an area.

In areas where unstable soils are located and the potential for natural revegetation is low, such activities can cause long range impacts on surface water quality, increase erosion, loss of wildlife habitat, and vegetative cover. Accidents such as fires, explosions, well blowouts, spills and leaks can lead to major contaminations and to higher temperatures for surface waters when oil enters stream, ponds or lakes.

Oil and gas activity can cause the degradation of water quality, and the reduction of water supplies. Water supplies can be lost or reduced during exploration from seismic testing, stratigraphic testing and wildcat drilling. During exploration the groundwater hydrology can be altered from the fracturing of impermeable zones below aquifers, permitting the water resources to be lost or reduced through verticle drainage. Well drilling can also require large quanties of water especially if porous and permeable formations are encountered.

During the production phase, the removal and handling of water from producing wells and separation facilities can cause further degradation of surface water quality. Upon abandonment of a producing oil field those facilities which contain residual oil, brine waste or solid wastes may cause further water pollution. Batteries tanks, sumps, and pipelines may deteriorate and release pollutants into adjacent surface and ground waters.

Injection of additional waters into a producing well may become necessary during the production phase to obtain additional oil production through flooding with massive amounts of water this may either be fresh or produced (brackish) water. Such production techniques generally require additional water resources and deplete the availability of groundwater supplies.

Clearing operations to prepare soil surfaces for the construction of roads or drilling pads would casue the major impacts to vegetation. Leaks, spills, and the disposal of liquid and solid wastes would be other sources of adverse impacts to both aquatic and terrestrial vegetation.

In exploratory phase, two primary activities would have an impact on wildlife populations and habitat these were off-road vehicles and exploratory techniques. Noise from heavy-duty exploratory vehicles and associated human involvement would adversely effect wildlife paraticularly ground nesting birds, reptiles, and burrowing animals. Seismic explorations utilize explosives, thumpers, and virators to test for oil and gas resources. These techniques distrub wildlife by disrupting their habitat and by creating loud, sudden noise. Oil spills and/or leaks, blowouts and spills or leaks of caustic salty or polluted water can cause adverse impacts.

Off-road vehicles, seismic activity and drilling of test wells, excavation of construction materials (sand and gravel), and the building of service road, and drilling pads causes soil particles to become unconsolidated and increase the soil's susceptability to wind and water erosion. The disposal of drilling muds and dumping of waste oil in sump pits would contaminate soils in the area of driling sites.

G. GEOTHERMAL

Geothermal energy is the natural heat contained and continously flowing from the earth. Today, it is providing to be a viable source of energy for the generation of electricity and space heating. There are four different types of high grade geothermal reservoirs that may be exploitable: the hyperthermal system, the geopressured system, the molten rock system, and the hot dry rock system. At present only the hyperthermal system is viable.

The hyperthermal systems which are being exploited around the world have extremely high temperatures (500-600° F), and often occur at depth (frequently two miles). All occur in hot fractured rock with a high water content. This water serves as a heat exchange medium which flows into the boreholes. The heat is then carried to the surface and to the electrical generating turbines. The pressure of the overlying rock and water generally keeps the water in the reservior in a liquid state, even when temperatures are far above the liquid's boiling point. However, as the drill bit penetrates the cap rock of the reservoir, the pressure is relieved and the contained water flashes to steam. A few reservoirs such as those found at the Geysers. California and Lardarello, Italy, consist of superheated, high pressure steam.

The largest geothermal development is underway at the Geysers geothermal field in California's Sonoma and Lake counties located about 90 miles north of San Francisco. The field yields almost 750,000 kilowatts of installed electrical generating capacity. Plans presently call for an additional 220,000 kilowatts of capacity. Predictions are that full development in the Geysers field will account for about 2 million kilowatts of generating capacity by the end of the decade (International Petroleum Encyclopedia, 1982).

Pacific Gas and Electric Comapany's complex of 17 geothermal power plants at the Geysers produced a record 6 billion kilowatt-hours of electricity in 1983 (California Energy Update, August 8, 1984). See Table G-1 for yearly production of electricity from geothermal sources.

Another development program is underway in Southern California's Imperial Valley. The geothermal resources present would generate more than 3 million kilowatts of electrical power capacity. A second prospect Herber within the Imperial Valley, contains enough geothermal energy to provide a capacity of 500,000 kilowatt for at least 30 years (International Petroleum Encyclopedia, 1982).

Utah Power and Light has proposed a 20,000 kilowatt electrical power generating plant fueled by geothermal energy from Roosevelt Hot Springs, in southwest Utah. Phillips has also entered into a commercial geothermal venture at Roosevelt Hot Springs. The Roosevelt prospect is thought to be capable of supporting 200,000 - 400,000 kilowatt of power capacity. Other areas of potential development Jemez Mountains, New Mexico, Dixie Valley, Nevada, and Desert Peak, California.

TABLE G-1
Production of Electricity from Geothermal Sources

Year	Year-End Capacity On Line (thousand kilowatts)	Production (million kilowatt-hours)
1979	742	3,889
1980	1,005	5,073
1981	1,005	5,686
1982	1,129	4,843
1983	1,331	6,075

Source: DOE, April 1984 Annual Energy Review, 1983.

Environmental impacts from the development of geothermal resources vary depending upon the pre- and post-lease exploration and development activities, and the nature of the geothermal find. Any effects of geothermal development upon climate will be localized and should not affect regional patterns. Local temperature patterns will change by several degrees due to waste heat emitted from the power plants, particularly from the cooling towers.

According to Department of Interior (1980) Final EIS for Proposed Leasing within the COSO Known Geothermal Resource Area, the principle gaseous emissions associated with geothermal development are the noncondensible gases hydrogen sulfide (H_2S) and carbon dioxide (CO_2), water vapor from flow testing and from cooling towers. In addition fugitive dust will be emitted into the atmosphere as a result of construction and vehicle activity as well as by wind erosion.

Noise impact can result from direct geothermal activities such as well drilling and power plant operation, as well as related activities as automobile and truck traffic. Noise can also result from developmental operations, during preparation and construction of well pads and power plants. Further noise impacts are likely to occur during drilling, cleanout, and flow listing of new wells. The noise associated with these activities are short-termed.

The operation of the power plant represents the major long-term continuous noise source resulting from geothermal development. Major contributors to the noise includes cooling towers, turbines and stream jet ejectors. The cooling towers which are physically large and have a large band frequency spectrum, become the dominant noise source at distances greater than 200 feet from the unit.

Subsidence and seismic activities may be accentuated during the production phase. The potential for subsidence is greatest in hot water systems produced from unconsolidated sediment. Since the majority of geothermal systems are in more competent rock they are not subject to large amounts of subsidence. Geothermal systems are often found in areas of seismic activity. Possible fault movements can result from the removal and reinjection of fluids causing cyclic variations in reservoir pressures.

Geothermal development requires cooling water, which could displace other uses or degrade other supplies. It also produces enormous amounts of liquid waste requiring disposal. Exploration and well drilling, and construction of development facilities can cause short term impacts of surface erosion and drilling waste disposal.

This could cause alteration of surface runoff and erosion patterns, sediment yield and ground water degradation. The development and production of geothermal energy could lower the water table, degradation of the natural water locally reduce the temperature of the fluids causing mineral precipitation and/or depletion of the geothermal reservoir.

The amount of land used and altered ranges from zero in the very earliest stages of exploration to many tens of acres in a field which has undergone full stage development. Surface disturbing activities are generally 1) road building, 2) drill pad, power lines and/or other facility site construction, and 3) construction and clearance of pipelines and transmission facilities.

Impacts on wildlife could result due to increased vehicular traffic, drilling activities, removal of wildlife habitat, and noise associated with construction and production activities.

Recreational uses would be affected by noise, dust, traffic conflicts, or physical displacement from specific recreation use areas. Public safety concerns could restrict recreational use of an area until drilling operations cease. Geothermal developemnt could modify the landscape character of an area if striking contrasts occur in form, line, color or texture of landscape features.

H. SOLAR

The sun is the plant's most abundant source of energy. Only a infinitesmal fraction of the sun's radient energy strikes the earth. It is estimated that about 180 trillion kilowatts of electricity, more than 25,000 times the world's present industrial power capacity is received.

The energy can be captured either directly through rooftop collectors, photovoltaic cells and building design features or indirectly through storage of solar energy in nature. The solar energy in trees, grasses, agricultural wastes garbage, and other organic materials can be burned to produce electricity or synthetic fuels (see Section C). Even wind which turns wind turbines to supply power, is an indirect form of solar energy (see Section I). In comparison to convential fuels, solar energy is relatively clean and pollution free.

Solar systems convert the sun's radiation in thermal heat for heating, air conditioning by the use of absorptive coolers, industrial process heat and electricity generation. There are four differenct solar thermal systems which have different temperature ranges, application and type of collectors: solar pond 140-180° F, flat plate 100-250° F, parabolic concentrating 300-1500° F, and heliostats 500-2000° F. Photovoltaic cells convert sunlight directly into electricity. Much of the recent work in solar energy production has focused on reducing the manufacturing costs of sloar collectors, improving their efficiencies and reliabilities, and simplifying their design and installation.

Solar technologies will require more land per unit of capacity than will convential enery systems due to the diffuse nature of the solar resource and the generally low efficiencies of solar devices. If the facility is to provide process steam to an industry or utility, the collectors must be in close proximity to the point of end use. If the plant is electricity generating it must give a clear access for an electrical interconnection with the local utility grid network. The amount of available solar radiation of a specific geographic location dictates the number and size of the collectors required. The amount of available solar radiation can vary dramatically from site to site, Table H-1 gives an estimate of the collector area to land area ratios.

Also of importance is sun rights. Height of structures, trees or land features on adjacent land especially on the south side is important so not to cause shading of the collectors. Sheahan (1981) reports that it is recommended that there be an uniterrupted view of the south down to an angle of 10 degrees above the horizon and clear to the southwest and the southeast to the point where the sun rises and sets on the summer solstice. This area may need to be controled through legal restrictions or land acquisition.

Land surfaces need to be flat as possible with grades not to exceed 10 percent. If the land is contoured more spacing would be required due to potential shading from collectors on the higher ground.

Areas with excessive wind would need to be avoided since wind blown sand and dirt would erode mirrored collector surfaces. Similarly high wind could cause structural damage to the sail-like collectors. Hailstones and heavy snowfalls could also damage the collectors.

Adjacent industrial facilities may give off air emissions which could erode mirrored collector sufaces. Solar energy will not contribute to air pollution except during the production of solar equipment or during the cleaning of the mirrors. Increasing solar use will cut emissions of particulates, hydrocarbons, sulfur oxides, carbon monoxides and nitrogen oxides. At the same time, solar systems will not increase atmospheric carbon dioxide levels which could cause major changes in global climate.

Some solar thermal electric plants with once through cooling, could have significant water requirements. Leakage and disposal of antifreeze and anti-corrosion fluids from solar heating and hot water systems could produce a minor water pollution problem.

The height of a solar power tower is significant and could be potentially as high as 1000 feet for a 100 megawatt plant, therefore if a solar plant sites is proposed in proximity to an airport of major airline route special precautions are required.

The solar reflections from heliostats and parabloic collectors can be very intense, therefore special precautions must be taken when working the the area of an operating collectors. The solar beam with an intensity of approximately 70 heliostats in Albuquerque, New Mexico melted through a 1/4 inch steel plate in two minutes. Therefore, cleaning and maintaining the mirrored surfaces would dicate a nightime procedure.

Biological resources can be affected during the stages of installation and development. There are also many possible effects from support activities, such as road building to provide access to the solar sites, development of electric feeder and tramsmission lines and construction and maintence of substations. Immediate habitat loss due to solar energy development would come during construction of roads, solar plant, substations and power distribution and transmission lines. Other indirect impacts include

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TABLE H-1
SOLAR ENERGY COLLECTOR TO LAND RATIOS

Collector	Collector Area	Land Area
Solar Pond	1.0	1.0
Flat Plate	1.0	2.0-2.2
Photovoltaic Array	1.0	2.0-2.2
Parabolic Trough	1.0	2.2-2.4
Parabolic Dish	1.0	3.4-3.8
Heliostats	1.0	3.0-3.8

Source: Sheahan, 1981

increased human activity, noise and visual disturbance, and subtle habitat changes, such as the invasion of new plant species in disturbed areas.

I. WIND TURBINES

Wind has been used as an energy source for centuries. Historians believe that the earliest wind machines probably were primitive devices used to grind grain in Persia around 200 B.C. Presently, manufactors are producing small wind machines (< 100 kiolwatts) to be used in homes, farms, factories, and small business. Although the home market for wind turbines is growing rapidly energy experts say that the type of wind technology that will most benefit the nation will be the large turbines that feed electricity to the utilities. Several utilities are experimenting with wind power.

Southern California Edison's ten year resource plan calls for generation of 2,100 megawatt of power from renewable resources by 1990. Wind turbines could contribute alomost 7 percent of these needs and provide 1,226 million kilowatt hours on an annual basis (DOI, 1982). Southern California Edison is targeting 360,000 kilowatts of wind generated power by 1990 (International Petroleum Encyclopedia, 1982).

International Petroleum Encyclopedia (1982) reports that Pacific Gas & Electric Co. signed a contract with Windfarms Ltd., San Francisco to buy most of the 350,000 kilowatts to be generated. This project will entail installation of 146 wind tubines at a cost of about $700 million. When completed in 1989, it could yield as much as 963 million kilowatt-hours of electricity.

PG&E also plans to purchase all the electricity to be generated by a wind park to be built by U.S. Windpower, Burlington, Mass. The project involves installation of 600 horizontal axis wind turbines. Cost of the project is estimated to be at $60 million.

California Energy Update (August 8, 1984) is reporting that wind project developers within California are announcing and installing record numbers of wind turbines. Over 2400 wind turbines totaling more than 250 megawatts have been approved by zoning commissions, planning councils or announced by project developers. Major projects include: Altamont Pass a total of 7,626 wind turbines, San Gorgonio Pass a total of 1352 wind turbines, and Techachapi 280 wind turbines have been permitted. At Altamont Pass a total of 2,400 have been already erected.

A wind turbine needs a supply of wind in order to operate. The velocity directions and time (frequency and duration) of the wind would need to be calculated prior to site selection. Potential obstructions such as buildings, vegetation and other wind turbines can affect the supply of wind to a wind turbine in two ways: the velocity can be altered; and the turbulence can be increased.

A decrease in velocity means reduced energy output and an increase in turbulence may reduce the energy output, and perhaps more critically reduce the useful life of the turbine. Building and vegetation are more of a problem with small machines and with machines in urban areas. The only man made structure in rural areas which would effect wind turbines is another wind turbine.

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Biological resources can be affected by many stages of wind energy development including initial material acquistion and processing, turbine production and assembly, turbine installation and operation. There are also many possible effects from support activities, such as road building to provide access to turbine sites development of electric feeder and tramsmission lines and construction and maintence of substations.

DOI (1982) reports that the direct impact of wind energy development on biological resources include two main cateogories: loss of animals through surface disturbance at turbine sites, in road and along power lines rights-of-ways, and at substations sites, disturbance of animal behavior through interference with courtship, rearing of the young, feeding and other necessary aspects of animal life histories.

Wildlife activity would decrease significantly in the immediate construction area or facility site, and animal territories near development will often be deserted. If associated long-term indirect impacts are high, developed area may be permently abandoned. Such indirect impacts include immediate habitat loss as well as long-term cumulative habitat deterioration.

Immediate habitat loss due to wind energy development would come during construction of roads turbines, substations and power distribution and transmission lines. Other indirect impacts include increased human activity, noise and visual disturbance, and subtle habitat changes, such as the invasion of new plant species in disturbed areas.

The potential exists for low incident rates of collision between birds and wind turbine generators. Placement of large turbines along ridge tops may impact the behavior of large soaring birds which utilize air currents deflected upwards by the terrain as a source of lift. Certain species small mammals, lizards would be very vulnerable to crushing and other direct impacts from constructions of the turbines and roads.

Noise impacts can result from the construction of the wind turbines by earth moving equipment, increased traffic on local roads and highways in the study area. There are a number of potential noise sources from wind turbine operations. Noise would be generated from the operation of the generator, the transformer, the gearbox, and from the wind turbine blades. The turbine blades would be the predominant noise source in the far-field of the wind turbine. The former noise sources would generally only be discernable in the near-field of the wind turbine.

Noise would be generated from a number of phenomena associated with wind turbine blade interaction with the air. The primary causes of noise are fluctuating lift resulting from the interaction of the blades with the atmospheric turbulence of the wind, the interaction of the blade turbulent boundary layer with the trailing edge of the blade, direct accoustic radiation from the turbulent boundary layer, direct acoustic radiation from the wakes of the blades, and intereaction of the tower wake with the turbine blades on wind turbines where the blades are downwind of the tower. Of these the first two are the dominant causes of noise. Noise associated with the operation of the wind turbines has become an increasing concern with residents in the area of the wind park.

Placement of the turbines in an area can cause the reduction in its suitablitiy for recreational and other land uses. Conflicts have arisen due to the potential placement of wind parks in areas designed for wilderness review, and in areas of high concentration of archaeological resources. Wind turbines are highly visible because of their height. Wind development in an area would have a significant visual impact on the existing landscape character. Impacts would result from the removal of vegetation, and soil disturbances associated with construction of wind tower pads, access and service roads, electrical transmission lines and the introduction of a variety of wind turbine structures.

Wind and water erosion are likely to result from the construction of wind farms in an arid environment. Localized desert pavement development would occur as a result of construction. This could result in a worsening of flood hazards potential and downstream sediment deposition. Changes in natural drainage courses could also increase channel erosion.

Wind turbines may interfere with television reception by causing visual distortions. Sengupta, et al. (1980) reports that interference to television reception is caused by the scattering of television signals by the wind turbines. In the vicinity of an appropriately oriented wind turbine a television receiver will receive the wind turbine scattered signals in addition to the direct signal. The scattering by the rotating blades of the wind turbine will produce both amplitude and phase modulations of the signals at the receiver. Since video information in television signals is transmitted by amplitude modulation, any extraneous amplitude modulation will, if sufficiently strong, distort the video reception.

The upper UHF channels are found to be particularly vulnerable to such distortions. For a give television channel the maxium distance from the wind turbine at which adverse interference may occur is a function of the wind turbine blade dimensions and orientations and the receiving antenna characteristics. The size of the interference decreases as the television channel number is decreased.

J. HYDROELECTRIC POWER

Many of the major hydroelectric sites operating today were developed in the early 1950's. The total developed and undeveloped hydroelectric power in the United States is 6.75 trillion kilowatt hours (see Table J-1).

1. Hydroelectric Dams

Hydroelectric power is energy from falling water, which is used to drive turbines and thus produce electricity. Conventional hydroelectric developments convert the energy of natural regulated stream flows falling from a height to produce electric power.

Pacific Gas and Electric (PG&E) 65 hydroelectric plants produced three time more energy in 1983 than in 1982 (almost 18.1 billion kilowatt-hours). In addition to production from its own hydro plants, PG&E purchased 24.5 billion kilowatt-hours of economical hydro power produced mainly in the Pacific Northwest. Hydroelectric power accounted for 59 percent of the electricity available to PG&E customers in 1983.

Table J-1
HYDROELECTRIC POWER IN THE UNITED STATES TOTAL POTENTIAL

Geographic Division	Average Annual Generation 1,000 Kilowatt Hours
New England	13,589,232
Middle Atlantic	37,763,815
East North Central	9,779,997
West North Central	17,645,343
South Atlantic	34,324,480
East South Central	27,879,762
West South Central	10,585,090
Mountain	97,658,028
Pacific	249,284,546
Alaska	176,290,145
Hawaii	333,400
Total United States	675,133,838

Source: Federal Power Commission, 1976

The construction of a dam for hydroelectric power causes the interuption of the flow of a river causing it to become a lake. This alters the physically unstable riverine ecosystem shifts into a relatively stable lacustrine ecosystem. Construction of the dam represents an irreversible commitment of the land resources beneath the newly created lake. Flooding eliminates wildlife habitat and prevents other uses such as agriculture, mining, and some recreational activities. The interuption of the river's flow, even if temporaily eliminated during the period required for the reservoir to be filled, can effect the flora and fauna downstream. However, with the construction of the dam new recreational facilities have been generated.

The changes in the hydrologic system that may result from the construction and operation of a hydroelectric dams are physical but can directly and indirectly bring about changes in all the dependent biological and human systems.

With the construction of the dam impacts could result from the relative stabilization of the water level in the basin with an impact on the volume of discharge and current velocity downstream this would affecting the energy flow of the ecosystem. Increase input to ground water supplies could result with possible benefits to distant aquifers. Reduction in turbidity through settling of sediments and possibly from the reduction of erosion in the new lake in comparision to the previous riverine ecosystem could result. Further probable reduction of turbidty downstream may also reflect settling (basin action) of the reservoir in addition to benefits of stabilized water flow through the system. Increase in basin evaporation loss could occur due to the existence of a large open body of water and perhaps increased by evapotranspiration of emergent aquatic plants.

Change in water chemistry would be detectable within the reservoir where in some cases causing stratification of the water represented by deep-water oxygenless zones. This zones would be unable to support fish life. The decomposition within the reservoir of submerged vegetation and organic material may produce an explosive release of chemical nutrients to the biosystem. Alteration of water temperature would occur not only within the reservoir but also downstream from the influence of the lake-water outflow from the dam.

Atmospheric effects depend on moisture content, temperature movement of air masses, along with regional topography size of reservoir can cause an alteration in the local microclimate.

The biological systems in the reservoir area and downstream usually show sharp changes as a result of the dams effect on the hydrologic system. This can have an effect on the terrestrial and aquatic ecosystesm. The terrestrial habitat above the dam shrinks as the reservoir fills, yet the land-water interface increases both factors will be reflected in the floral and faunal changes.

Downstream if seasonal flooding has been arrested along established patterns of water-soil fertility relationships will be altered. Usually with net reduction of soil moisture content and changes in nutrient input and nutrient cycling resulting in changes in flora and fauna.

Aquatic ecosystems initial flooding drowns plant, animals, and organic soil components sets the range for a sudden release of nutrients into the water. This can cause an increase in the density and extent of higher aquatic plants. An increase in the aquatic plants within the reservoir can cause interference with human activities such as boating, fishing, and power generation.

For migratory aquatic species a hydroelectric dam may act as a physical barrier that can be ultimately distructive to a species population.

2. Pumped Storage Projects

Pumped storage projects generate electric power by releasing water from an upper to a lower storage pool and then pumping the water back to the upper pool for repeated use. A pumped storage project consumes more energy than it generates but converts offpeak, low value energy to high value peak energy. To meet peak load requirement power companies have been turning more and more to pumped storage hydroelectric stations. There are many advantages to pumped storage hydroelectric power. It increases the number of sites acceptable for construction of dams whose primary purpose is to supply peak power needs.

Relatively small stream flows can support large generating capacities because water is stored and a portion of it can be reused. The pumped storage plant also does not require a large stream in a deep natural valley.

Pacific Gas and Electric Company announced in 1984 that the Helms Pumped Storage Project, the largest hydroelectric plant in its 66-plant hydro system, has begun commerical operation. Located about 50 miles east of Fresno, California, the plant produces electricity during peak hours by drawing water from the Courtright Reservoir. Once the water passes through the hydraulic turbine-generator, it is released into Wishon Reservoir and held there until nightime. The units are then reversed and the water is pumped back up to the Courtright Reservoir for use during the next peak period. The three units at The Helms Project are capable of generating 402,000 kilowatts apiece (California Energy Update, July 1984) total capacity would be approximately 1.2 million kilowatts. Making any one of the units among the largest reversible hydroelectric systems in the world.

Created lakes and impoundments for pumped storage are usually in hundreds of acres, vs. hundred of thousands of square miles. The impact to local water systems caused by the construction of the dam can be servere (see Section J.1) and can effect total changes in the area. The pumped storage project changes need not be as great since they are physically smaller and constitute appendages on local water systems. Water in pumped storage systems can be reused, natural flows are only required for make up purposes and the initial filling. Perculation from the upper reservoir into locally surrounding land can cause land instability and water quality impacts. The reservoirs can cause confusion and disruption of migratory fish species. Non-migratory species seem to survive in and the upper reservoir this area can be utilized for sportfishing.

Although each case is a special involving local characteristics of terrain, water quality and flow patterns, fish population, human factor, and effects on visual experience of the country side the total adverse impacts are less than the conventional hydroelectric power plant.

K. Nuclear Power

Commerical use of nuclear fission as an energy souce has a history of less than 30 years. This first electric power generating plant went into opration at Shippingport, Pennsylvania in 1957. At present there are 86 operable nuclear power generating plants in the United States with a maximum dependable capacity of 69.522 million net kilowatts (see Tables K-1 and 2). Although nuclear energy is a viable alternative energy source delays, and cancellation of plants have occurred. It has been argued that nuclear power plants are unsafe and uneconomical since the incident at Three Mile Island.

1. Light Water Reactor

There are two main types of nuclear reactors: the light water reactors which are widely used in the United States; and gas cooled reactors which are used in the United Kingdom. The light water reactor uses ordinary water as the moderator and as the coolant. There are two basic types of light water reactors boiling water and the pressurized water reactors.

In the boiling water reactor the cooling water boils in the core, and the steam generated is used directly to drive a steam turbine, which drives a generator. The steam is then condensed to water and pumped back to the reactor to complete the cycle. The reactor therefore acts as the boiler in the process.

In the pressurized water reactors the core cooling water is kept at a very high pressure and is heated to 600° C. The water is then sent to a separtate heat exchanger, where a secondary water supply is boiled and used to drive the turbines.

The problem with the boiling water type is that the cooling water becomes radioactive from slight leaks in the thin cladding of the fuel rods, and/or radioactively induced by the neutrons just outside the cladding. The radioactive steam goes directly to the turbines, so great care must be exercised to avoid steam leaks in the turbine. This problem is avoided in the pressurized water reactor system due to the cooling water and the steam for driving the turbines being kept separate.

McMullan et al., (1983) reports that there are two main criticisms of light water moderated reactors, first it is alleged that the technology of welding the very heavy steel sheets of the pressure vessels is not capable of providing the necessary reliablity. This is important due to the potential catastropy which would occur if the pressure vessel were to rupture. Manufacturers claim that the chances of this happening are so small that the risk is acceptable. Secondly, there are the possible effects of a sudden failure in the water supply to the core. If this were to occur, the large mass of fuel and radioactive fission products, could become so hot as to cause a melt down. From a melt down radioactive containment could possibly inflitrate the ground water supply and become a hazard.

TABLE K-1
Status of Nuclear Reactor Units, December 31, 1983

	Number of Reactors				Capacity (thousand net kilowatts)	
Status	Boiling Water Reactors	Pressurized Water Reactors	Other	Total	Total	Average (per reactor)
Operable	26	52	2	80	62,809	785
In Startup....................	3	0	0	3	3,431	1,144
Construction Permits Granted...	16	37	0	53	59,064	1,114
Construction Permits Pending...	0	0	0	0	0	—
Units on Order................	0	2	0	2	2,240	1,120
Total........................	45	91	2	138	127,544	924

[1] The capacity for operable units is net Maximum Dependable Capacity (MDC). For other units the capacity is net Design Electrical Rating (DER).

[2] Includes one graphite-moderated and one gas-cooled reactor in full operation.

[3] Based on the net Design Electrical Rating (DER).

[4] Includes units with "full power" or "operating license" units (units in power ascention or in commercial operation). Excludes the following previously licensed units which have been inoperative for at least 4 years: Humboldt Bay; Dresden-1; and Three Mile Island-2. Three Mile Island-1 is considered operable although it has not been permitted to operate since March 1979.

Source: DOE, April 1984, Annual Energy Review, 1983.

Table K-2
Nuclear Power Plant Operation

	1979	1980	1981	1982	1983	1984
Operable Reactors (Number)	68	70	74	77	80	86
Nuclear Based Electricity Generation (Million Net Kilowatt Hrs)	225,155	251,116	272,674	282,773	293,677	328,177
Nuclear Portion of Domestic Electric Generation (Percent)	11.4	11.0	11.9	12.6	12.7	13.5
Maximum Dependable Capacity of Operable Reactors (Million Net Kilowatts)	49.326	51.059	55.534	59.552	62.809	69.522*

*Preliminary Data
Source: DOE, February 1985 Monthly Energy Review, December 1984.

2. Breeder Reactors

In breeder reactors neutrons are captured by U^{238} to form Pu^{239}. No moderator is used in the reactor core to slow the neutrons down, as a result the neutrons are capture by the uranium. From this reaction the reactor produces significant quantities of plutonium.

The breeder reactor has some unpleasant charcteristics which are regared by its critics as rendering it unacceptable for generating electric power. The first of these is that plutonium is highly toxic. It also has a very low thermal conductivity which adds to the difficulty of extracting the heat from the reactor core. Further, there is no moderator, the core runs at a very high energy density and must be cooled, not by water or a gas but by a liquid metal - sodium. The sodium therefore, must reach extremely high speeds in the tightly packed core in order to remove the heat which is generated. Failure to remove the heat would lead to a situation which could cause a melt down, if the reactor was left uncorrected.

Sodium in itself is a highly reactive metal which reacts explosively with water. In the breeder reactor the sodium is pumped around the reactor core at an elevated temperature, and after a while the coolant would become radioactive. Any rupture or leak in the cooling system would cause and extremely violent reaction.

Another major criticism of the breeder reactor is it uses plutonium as its primary fuel. The fuel rods are enriched in Pu^{239} which can be used as fuel for a nuclear bomb.

Most failures of commercial reactors have been minor in nature except for the incident at Three Mile Island which indicates the potential dangers of nuclear power generation. Since Three Mile Island there has been a large increase in public concern fo the safety of these power plants. Attempts have been made to stop all future construction, and to shut down all existing nuclear plants in some areas. Yet, dependence on this power source tends to preclude total shut down as no suitable alternative is available.

Nuclear plants use essentially the same cooling process as fossil-fueled plants and thus share the problem of heat dissipation from cooling water. However, nuclear plants obtain 33 percent conversion to electricity with all the remaining 67 percent going to the cooling water, thereby, requiring larger amounts of cooling water and discharge greater amounts of waste heat to the water than comparably sized fossil-fuel plants. In comparison, per modern fossil fuel plants contribute per unit of electric energy generated 1.2 units of acquatic thermal pollution while nuclear plants contribute 2.0 units.

Thermal pollution causes damage by upsetting or modifying aquatic ecosystems. Thermal pollution can distrub an ecosystem in a variety of ways: 1) large temperature increase/decrease can directly kill many aquatic species, 2) reduction of available oxygen (as temperature increases solubility of oxygen decreases), 3) alteration of the rate of biological activity (ie. rapid grouth of algae or pond weeds), 4) reduction of resistence to diseases,

5) alteration of behavior patterns, 6) providing a competitive advantage to species which can tolerate temperature changes.

Increase concern has been raised for the potential danager of leakage of radiation. Damage to an organism can result in acute somatic damage when a large dose of radiation is sustained. It can cause fatal damage to a large number of cells resulting in radiation sickness (nausea, vomiting, headaches, weakness, and sometimes death). Delayed somatic damage when an organism receives a dose of radiation that is not fatal.

Cells lethally damaged by the dose will not reproduce and be eliminated. Cells damaged non-lethally will stay with the organism and may cause malfunctions later (cancer, cataracts, prenatal abnormalities, and non-specific shortening of life span). Genetic damage where a reproductive cell is non-lethally damaged. This may give rise to a genetically defective offspring.

While impacts associated with an accident in a nuclear power plant are serious, a more long-term impact can result due to the storage problems associated with the waste products from power generation.

Low level radioactive wastes from normal operation of a nuclear plant must be collected, placed in protective containers, and shipped to a federally licensed storage site and buried. High level wastes created within the fuel elements remain there until the fuel elements are processed.

Low level radioactive solid waste are buried in near suface trenches at specific sites where topography, meteorology, and hydrology are such taht migration of radioactivity is not anticipated. Land requirements for the low level waste from a 1000 megawatt plant and the fuel cycle activity attributed to the plant are about 2.0 acres per year.

High level wastes are stored a liquids in tanks. Storage has been suggested in beded salt formations deep underground. Currently, spent fuel is stored at Nuclear Regulatory Commission licensed facilities. Plans call for recovering unused fuels at reprocessing plants, solidify the wastes and placing them in storage at Federal Repositories.

3. Uranium

The domestic uranium industry. over its 35-year history, has witnessed two boom-to-bust cycles. In the early 1950's, the United States increasing need for uranium for its defense needs far exceeded the world production capabilities. Consequently, the United States Government instituted a production incentive program that created both the domestic and foreign uranium producing industries. Industry responds to the Governments price and purchase guarantees was so large that the program was phased out in the 1960's and terminiated in 1970. The Government presently has sufficient stockpiles to meet military requirements well into the future.

The withdrawal of the Government from its role as the major purchaser of uranium caused the first "bust" period. At that time the needs of the emerging commerical nuclear power industry were not yet great enough to support the uranium production industry.

Production and prices declined until the mid-1970's when an expected increase in future demands and the long-term purchasing of uranium lead to the second "boom" period. This caused a rapid increase in uranium prices and production. Contracting for uranium was based on demand expectations well into the future, and did not fully materialized due to subsequent cancellations and deferrals of planned nuclear power plants. As a result, excess production capacity and utility inventories of uranium increased well beyond actual needs, leading to the second "bust" period in late 1980.

The price of uranium has dropped from $40.75/lb on December 31,1979, to $17.50/lb on August 30, 1984 (E&MJ, September 1984). This price decrease has casued numerous mines throughout the United States to shut down or reduce production. United States uranium reserves and resources which are list on Table K-3.

The impacts associated with the mining and milling of uranium ore are similiar to those for coal mining (see Section C) with the exception of radioactive tailings and water being produced.

L. CONSERVATION

Analyst expect conservation to be a signifcant energy source in the furture. Projections for United States' energy demand in the year 2000 which ranged between 150 quadrillion and 175 quadrillion Btu a decade ago, is now estimated to be around 110 quadrillion to 150 quadrillon (Sweet, 1982). Energy consumption in the United States falls into four basic categories: residential, industrial, commerical, and transportation. Including the transportation activities necessary for busness needs, some 70 percent of all the energy used in the United States is consumed by the business community.

Several studies have concluded that during the past two years that conservation (the more efficient use of energy resourses without detriment to the nation's standard of living) is the most promising single means of reducing the countries dependence on imported oil. In Germany and France, per capita consumption of energy is much lower than in the United States, and 50 to 75 percent less energy is used to produce each unit of output. Yet, the quality of life in those countries is similar to America, and their products compete sucessfully with United States' goods in the world market. If the United States were to make a serious commitment to conservation it could consume 30 to 40 percent less energy than present, and still enjoy the same standards.

Consevation is a form of adjustment entailing such things as insulating the house, making automobiles, industrial processes, and home appliances more efficient and acapaturing waste heat. Conservation efforts in the United States have been more sucessful in the industrial and commerical sectors than in the residential sector. Since there are many more residential consumers than there are industrial users, more time will be required to inform the public on conservation techniques. Congress has also provided tax credits to homeowners who insulate their homes or purchase alternative energy systems such as solar heaters.

Table K-3
Uranium Resources, January 1, 1983
(Thousand Short Tons, U_3O_8)

Class	Forward Cost (dollars per pound)[1]		
	$30 or Less	$50 or Less	$100 or Less
Reserves[2]	180	576	889
Potential Resources.....	1,127	2,066	3,381
Probable...............	654	1,167	1,887
Possible...............	257	508	842
Speculative............	216	391	652
Total...................	1,307	2,642	4,270

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[1] Forward costs are those costs yet to be expanded, and, therefore, do not represent prices at which U_3O_8 will be sold.

[2] Does not include 140,000 tons of U_3O_8 estimated to be available as a by-product of phosphate and copper production during the 1980-2010 time period.

Source: DOE, April 1984, Annual Energy Review, 1983.

APPENDIX D
Glossary

GLOSSARY

Acute - short term severe or intense impacts may be felt, bioassays of generally 96 hours of less.

Aliphatic - Of or pertaining to any organic compound of hydrogen and carbon characterized by a straight chain of the carbon atoms; three subgroups of such compounds are alkanes, alkenes, and alkynes.

Anadromous fish - fish that migrate up rivers from the sea to breed in fresh water.

Anomaly - deviation from normal condition.

Anthropogenic - coming from human sources.

Anticline - An upfold or arch of stratified rock in which the beds or layers bend downward in opposite directions from the crest or axis of the fold.

API gravity - A special function of relative density which is the inverse of the usual scientific specific gravity term. It actually expresses a function of volume per unit weight with a higher number indicating that the crude oil (or other petroleum material) contains a higher content of gasoline and other light components.

Areas of high marine productivity - Include areas in the Gulf of Mexico such as open bays, estuaries, and sounds that are used by finfish and shellfish as nursery and/or spawning grounds and may contain oyster reefs; nearshore areas that are important harvest grounds for food and industrial fish and/or finfish and shellfish spawning grounds; and coral areas.

Aromatic - Applied to a class of organic compounds containing benzene rings or benzenoid structures.

Asphaltene - Any of the dark, solid constituents of crude oils which are soluble in carbon disulfide but insoluble in paraffin napthas.

Ballast treatment - Treatment of a tanker's ballast water, which is contaminated by residuals of the original tanker cargo.

Barrel - Equal to 42 U.S. gallons.

Basin - A depression of the earth in which sedimentary materials accumulate or have accumulated, usually characterized by continuous deposition over a long period of time; a broad area of earth beneath which the strata dip, usually from the sides toward the center.

Benthic - bottom dwelling.

Benthic macroinvertebrate - animals such as worms, clams, or crabs which are large enough to see without the aid of a microscope.

Biological opinion - An appraisal from either FWS or NMFS evaluating the impact of a proposed activity on endangered and threatened species.

Biomass - weight of living organisms.

Block - A geographical area, as portrayed on an official MMS protraction diagram or leasing map, that contains approximately nine square miles (2,304 hectares or 5,760 acres).

Blowout - Refers to an uncontrollable flow of fluids from a wellhead or wellbore. Unless otherwise specified, a flow of fluids from a flowline is not considered a blowout as long as the wellhead control valves can be automatically or manually activated. If the wellhead control valves become inoperative the flow is classified as a blowout.

Blowout preventer - A stack or an assembly of heavy-duty valves attached to the top of the casing to control well pressure.

Bunker fuel - Heavy residual fuel oil used in ships' boilers and in large heating and generating plants.

Caprock - A disk-like plate over all or part of the top of most salt domes in the Gulf coast states, composed of anhydrite, gypsum, limestone, and occasionally sulfur. Caprock may also be a comparatively impervious stratum immediately overlying an oil- or gas-bearing rock in an anticline.

Carrying capacity - the maximum number or weight of individuals that can exist in a given habitat.

Cetacean - any of an order (Cetacea) of aquatic mostly marine mammals including the whales, dolphins, porpoise and related forms with large head, fishlike nearly hairless body, and paddle-shaped forelimbs.

Coastal subareas - Discrete analysis areas (consisting of several counties/parishes) within the larger offshore coastal areas.

Coastal waters - Those waters surrounding the continent which exert a measurable influence on uses of the land.

Coastal wetlands - Include forested and nonforested habitats, mangroves, and all marsh islands which are exposed to coastal waters. Included in forested wetlands are hardwood hammocks, cypress-tupelogum swamps, and fluvial vegetation/bottomland hardwoods. Nonforested wetlands include fresh, brackish, and salt marshes. These areas directly contribute to the high biological productivity of coastal water by input of detritus and nutrients, by providing nursery and feeding areas for shellfish and finfish, by serving as habitat for many birds and other animals, and by providing waterfowl hunting and fur trapping.

Coastal zone - The coastal waters (including the lands therein and thereunder) and the adjacent shorelands (including the waters therein and thereunder), strongly influenced by each other and in proximity to the shorelines of the several coastal states, and includes islands, transitional and intertidal areas, salt marshes, wetlands, and beaches. The zone extends seaward to the outer limit of the United States territorial sea. The zone extends inland from the shorelines only the extent necessary to control shorelands, the uses of which have a direct and significant impact on the coastal waters. Excluded from the coastal zone are lands the use of which is by law subject to the discretion of or which is held in trust by the federal government, its officers, or agents.

Commingling - Bringing together the production from wells, leases, pools, and fields with production of other operators.

Completion - Conversion of a development well or an exploratory well into a production well of oil and/or gas.

Condensate - Liquid hydrocarbons produced with natural gas that are separated from the gas by cooling and various other means. Condensate generally has an API gravity of 50°-120° and is water-white, straw, or bluish in color.

Conditional resources - Assessment of oil or gas resources under the assumption that economically recoverable resources exist within the area of interest.

Continental margin - A zone separating the emergent continents from the deep sea bottom.

Continental shelf - A broad, gently sloping, shallow feature extending from the shore to the continental slope.

Continental slope - A relatively steep, narrow feature paralleling the continental shelf; the region in which the steepest descent to the ocean bottom occurs.

Contingency plan - A plan for possible offshore emergencies prepared and submitted by the oil or gas operator as part of the Plan of Development and Production.

Critical habitat - an area that is essential to the conservation of a species.

Deferral - Action taken by the Secretary of the Interior at any time until the Final Notice of Sale to remove certain areas/blocks from the proposed sale.

Deletion Alternative - A option available to the Secretary of the Interior to alter the proposed action by deleting areas/blocks from the sale. This action would normally take place after completed analysis is available in the Final EIS.

Delineation well - An exploratory well drilled to define the areal extent of a field. Also referred to as an "expendable well."

Designated environmental preservation areas - Shorefront areas which have been established for the quality and significance of their natural environments. They have been legislatively, administratively, or privately protected from the developmental influences of man and are managed solely for the preservation, understanding, and appreciation of their natural attributes. Included are National Parks and Preserves, National and State Wilderness Areas, National Marine and Estuarine Sanctuaries, National Natural Landmarks, Wildlife Sanctuaries, State Aquatic Preserves, Refuges, Critical Habitats, or Sanctuaries and Environmentally Endangered Lands.

Detritus - Particulate organic matter originating primarily from the physical breakdown of dead animal and plant tissue.

Detritivores - Animals whose diet consists of detritus and the microbial fauna attached to detrital particles.

Development - Activities that take place following discovery of minerals in paying quantities, including geophysical activity, drilling, platform construction, and operation of all onshore support facilities; and that are for the purpose of ultimately producing the minerals discovered.

Development well - A well drilled into a known producing formation in a previously discovered field. To be distinguished from a wildcat, or exploratory well and from an offset well.

Development/production service base - A service base which is used in support of offshore development and production activity.

Diapir - A piercing fold; an anticlinal fold in which a mobile core, such as salt, has broken through the more brittle overlying rocks.

Dilution - The reduction in the concentration of dissolved or suspended substances by mixing with water.

Discharge - Something that is emitted; flow rate of a fluid at a given instant expressed as volume per unit of time.

Discovery - The initial find of significant quantities of fluid hydrocarbons on a given field on a given lease.

Dispersion - A distribution of finely divided particles in a medium.

Dome - A roughly symmetrical upfold, the beds dipping in all directions, more or less equally, from a point; any structural deformation characterized by local uplift approximately circular in outline, for example, the salt domes of Louisiana and Texas.

Drill ship - A self-propelled, self-contained vessel equipped with a derrick amidships for drilling wells in deep water.

Drilling mud - A special mixture of clay, water, or refined oil, and chemical additives pumped downhole through the drill pipe and drill bit. The mud cools the rapidly rotating bit; lubricates the drill pipe as it turns in the well bore; carries rock cuttings to the surface; serves to keep the hole from crumbling or collapsing; and provides the weight or hydrostatic head to prevent extraneous fluids from entering the well bore and to control downhole pressures that may be encountered (drilling fluid).

Economically recoverable resource estimate - An assessment of hydrocarbon potential that takes into account the physical and technological constraints on production and the influence of costs of exploration and development and market price on industry investment in OCS exploration and production.

Effect- A measurable alteration or change in environmental conditions.

Effluent - The liquid waste of sewage and industrial processing.

Endangered and threatened species - Those species identified in 43 FR 238 (December 11, 1978) and subsequent publications. This refers to any species which is in danger of extinction throughout all or a significant portion of its range and has been officially listed by the appropriate Federal or State agency; a species is determined to be endangered (or threatened) because of any of the following factors: a) the present or threatened destruction, modification, or curtailment of its habitat or range; b) overutilization for commercial, sporting, scientific, or educational purposes; c) disease or predation; d) the inadequacy of existing regulatory mechanisms; or e) other natural or man-made factors affecting its continued existence.

Environmental impact statement - A statement required by the National Environmental Policy Act of 1969 (NEPA) or similar state law in relation to any major action significantly affecting the environment; a NEPA document.

Epibenthic organism - those organisms attached to, or living on a substrate as opposed to those which burrow and live in the substrate.

Epiphyte - a plant growing attached to another plant.

Estuary - Semienclosed coastal body of water which has a free connection with the open sea and within which seawater is measurably diluted with fresh water.

Eutrophic(ation) - Rich in dissolved nutrients (as phosphates) but often shallow and seasonally deficient in oxygen.

Expected impact - Those alterations or changes to environmental conditions estimated to be probable or likely to occur as a result of a proposed action.

Exploration - The process of searching for minerals. Exploration activities include: (1) geophysical surveys where magnetic, gravity, seismic, or other systems are used to detect or infer the presence of such minerals and (2) any drilling, except development drilling, whether on or off known geological structures. Exploration also includes the drilling of a well in which a discovery of oil or natural gas in paying quantities is made and the drilling, after such a discovery, of any additional well that is needed to delineate a reservoir and to enable the lessee to determine whether to proceed with development and production.

Exploratory well - A well drilled in unproven or semi-proven territory for the purpose of ascertaining the presence underground of a commercial petroleum or natural gas deposit.

Exposed coastline - Shoreline areas directly impactible by OCS waters. All of the shoreline not classified as unexposed is exposed.

Fault - A fracture in the earth's crust accompanied by a displacement of one side of the fracture with respect to the other.

Fauna - animals, especially the animals of a particular region or time.

Field - An area within which hydrocarbons have been concentrated and trapped in economically producible quantities in one or more structural or stratigraphically related reservoirs.

Fissiped - Sea otter.

Fledge - to rear until ready for flight or independnet activity.

Fledgling - a young bird just fledged.

Florida hummocks - Areas of higher elevation than their surroundings and characterized by hardwood and/or palm vegetation (hammocks).

Flowlines - Pipelines that move oil from a header system, tank platform, or other facility to a point of final metering, processing, and/or sale.

Flyway - an established air route of migratory birds.

Gathering lines - Pipelines used to bring oil from production leases by separate lines to a central point, that is, a tank farm or a trunk pipeline.

Geochemical - Of or relating to the science dealing with the chemical composition of and the actual or possible chemical changes in the crust of the earth.

Geologic hazard - A feature or condition that, if unmitigated, may seriously jeopardize offshore oil and gas exploration and development activities. Mitigation may necessitate special engineering procedures or relocation of a well.

Geomorphology - The science of surface landforms and their interpretation on the basis of geology and climate.

Geophysical - Of or relating to the physics of the earth, especially the measurement and interpretation of geophysical properties of the rocks in an area.

Geophysical survey - The exploration of an area during which geophysical properties and relationships unique to the area are measured by one or more geophysical methods.

Gross regional product - total value added generated from all sectors in the regional economy including government and households. (See value added.)

Habitat - A specific type of place that is occupied by an organism, a population, or a community.

Haul-out area - specific locations where pinnipeds come ashore and concentrate in numbers to rest, breed, and/or bear young.

Herbivores - Animals whose diet consists of plant material.

High density offshore shellfish areas - Include nearshore areas known to have the highest concentrations of commercially important shrimp, lobster, and crab.

Hydrocarbon - Any of a large class of organic compounds containing primarily carbon and hydrogen, comprising paraffins, olefins, members of the acetylene series, alicyclic hydrocarbons, and aromatic hydrocarbons, and occurring in many cases in petroleum, natural gas, coal, and bitumens.

Hypothermia - subnormal temperature of the body, usually due to excessive heat loss.

Impact - A measurable alteration or change in environmental conditions.

Indirect (socio-economic) effects - caused by activities which are stimulated by an action but not directly related to it.

Industry infrastructure - The facilities associated with oil and gas development, e.g., refineries, gas processing plants, etc.

Jack-up rig - A barge-like, floating platform with legs at each corner than can be lowered to the sea bottom to raise the platform above the water.

Land segment - A subarea, usually consisting of a county or parish, within the coastal subarea.

Landfall - The site at which a marine pipeline comes to shore.

Land use - The function for which people employ an area of land.

Lay barge - A shallow-draft, barge-like vessel used in the construction and laying of underwater pipelines.

Lease - Any form of authorization which is issued under Section 8 or maintained under Section 6 of the Outer Continental Shelf Lands Act and which authorizes exploration for, and development and production of, minerals.

Lease sale - The competitive auction of leases granting companies or individuals the right to explore for and develop certain minerals within a defined period of time.

Lease term - For oil and gas leases, a period of either five years or up to ten years (when a longer period is necessary to encourage exploration and development in areas because of unusually deep water or other adverse conditions (see primary term)).

Lighter - A barge or small tanker used to move cargo from a large ship to port; also, to transport by lighter.

Major shorefront recreational beaches - Those frequently visited sandy areas along the shorefront which support a multiplicity of recreational activity, most of which is focused at the land-water interface. Included are National Seashores and other selected areas in the National Parks System, State Park and Recreational Areas, county and local parks, urban beachfronts, and private resort areas.

Major accidents - Includes spills of 10,000 gallons (238 bbls) or more and includes those blowouts, explosions, and fires which result in major structural damage or loss of life.

Mariculture - the breeding or growth of marine animals and plants to increase their stocks.

Marshes - Persistent emergent nonforested wetlands characterized by vegetation consisting predominantly of cordgrasses, rushes, and cattails.

Microcrustacean - any relatively small crustacean (may range from microscopic to slightly over one centimeter in size) including organisms such as beach hoppers (amphipods), copepods, ostracods, isopods, and mysids.

Military Warning Area - An area established within which the public is warned that military activities take place.

Mysids - small shrimp-like organisms.

Offloading - Another name for unloading; offloading refers more specifically to liquid cargo, crude oil, and refined products.

Offshore marine recreational fishing - Hook and line sport fishing from a boat seaward of the beach; for fun, food or occasional incidental profit, inclusive of spearfishing.

Offshore monobuoy - A buoy system at which a tanker may anchor, discharge, or load petroleum products.

Operational discharge - A release of oil that is part of the routine operations of a function.

Organic matter - Material derived from living plant or animal organisms.

Outer Continental Shelf (OCS) - All submerged lands that comprise the continental margin adjacent to the United States and seaward of state offshore lands.

Ovoviviparous - producing eggs that hatch within the female's body.

Penaeids - Chiefly warm water and tropical prawns belonging to the family Penaeidae.

Petroleum - An oily, flammable bituminous liquid that occurs in many places in the upper strata of the earth, either in seepages or in reservoirs; essentially a complex mixture of hydrocarbons of different types with small amounts of other substances; any of various substances (as natural gas or shale oil) similar in composition to petroleum.

Phytoplankton - plant (photosynthetic) plankton.

Pinniped - any of a suborder (Pinnipedia) of aquatic carnivorous mammals (e.g., seals, sea lions) with all four limbs modified into flippers.

Plan of Development and Production - A plan describing the specific work to be performed, including all development and production activities that the lessee(s) propose(s) to undertake during the time period covered by the plan and all actions to be undertaken up to and including the commencement of sustained production. The plan also includes descriptions of facilities and operations to be used, well locations, current geological and geophysical information, environmental safeguards, safety standards and features, time schedules, and other relevant information. Under 30 CFR 250.34-2, all lease operators are required to formulate and obtain approval of such plans by the Director of the Minerals Management Service before development and production activities may commence.

Plan of Exploration - A plan based on available relevant information about a leased area that identified, to the maximum extent possible, the potential hydrocarbon accumulations and wells that the lessee(s) propose(s) to drill to evaluate the accumulations within the entire area of the lease(s) covered by the plan. Under 30 CFR 250.341, lease operators are required to formulate and obtain approval of such plans by the Director of Minerals Management Service before significant exploration activities may commence.

Plankton - Passively floating or weakly motile aquatic plants and animals.

Platform - A steel, concrete, or gravel structure from which offshore development wells are drilled.

Porous - Containing void spaces that may be occupied by fluids.

Potable - Drinkable, suitable for drinking.

Potential impact (effect) - The range of alterations or changes to environmental conditions that could be caused by a proposed action.

Primary production - Production of carbon by a plant through photosynthesis over a given period of time.

Primary term - The initial period of oil and gas leases, normally five years (see lease term).

Production - Activities that take place after the successful completion of any means for the removal of minerals, including such removal, field operations, transfer of minerals to shore, operation monitoring, maintenance, and workover drilling.

Production curve - A curve plotted to show the relation between quantities produced during definite consecutive time intervals.

Production schedule - A percentage distribution intended to show quantities of oil or gas produced over a consecutive time interval.

Production well - A well which is drilled for the purpose of producing oil or gas reserves. It is sometimes termed development well.

Province - An area throughout which geological conditions have been similar or that is characterized by particular structural, petrographic, or physiographic features.

Purse seine - a fishing net that is pursed or drawn into the shape of a bag to enclose the catch.

Rare - refers to any species whose continued existence is threatened by one or more conditions and has been officially listed by the appropriate State agency; a species is determined to be rare because of any of the following conditions: a) the species is confined to a relatively small and specialized habitat and is incapable of adapting to different environmental conditions; b) the species, although found in other parts of the world, is nowhere abundant; c) the species is so limited that appreciable reduction in range, numbers, or habitat would cause it to become endangered; or d) the species would become endangered if current management and protection programs were diminished to any degree.

Recoverable resource estimate - An assessment of oil and gas resources that takes into account the fact that physical and technological constraints dictate that only a portion of resources or reserves can be brought to the surface.

Refining - Fractional distillation, usually followed by other processing (for example, cracking).

Relief - The elevations or inequalities of a land surface.

Reserve estimate - An assessment of the portion of the identified oil or gas resource that can be economically extracted.

Reserves - Portion of the identified oil or gas resource than can be economically extracted.

Reservoir - An accumulation of hydrocarbons that is separated from any other such accumulation.

Rig - A structure used for drilling an oil or gas well.

Right-of-way - A legal right of passage, an easement; the specific area or route for which permission has been granted to place a pipeline, ancillary facilities, and for normal maintenance thereafter.

Risked, economically recoverable resource estimate - An assessment of oil or gas resources that has been modified to take into account: physical and technological constraints on production; the influence of the costs of exploration and development and market price on industry investment in OCS exploration and production; and the uncertainty of the estimate and to account for the possibility that economically recoverable resources may not be found within the area of interest.

Rookery - the nesting or breeding grounds of gregarious (i.e., social) birds or mammals; also a colony of such birds or mammals.

Saltwater intrusion - Phenomenon occurring when a body of salt water, because of its greater density, invades a body of fresh water. Occurs in either surface or groundwater sources.

Sciaenids - Fishes belonging to the croaker family (Sciaenidae).

Seagrass beds - More or less continuous mats of submerged rooted marine flowering vascular plants occurring in shallow tropical and temperate waters. Seagrass beds provide habitat, including breeding and feeding grounds for adults and/or juveniles of many of the economically important shellfish and finfish. As such, this habitat type is especially sensitive to oil spill impacts.

Sediment - Material deposited (as by water, wind, or glacier) or a mass of deposited material.

Sedimentary rocks - Rock formed of mechanical, chemical, or organic sediment.

Seismic - Pertaining to, characteristic of, or produced by earthquakes or earth vibration; having to do with elastic waves in the earth.

Sensitive coastal habitats - Coastal habitats susceptible to damage from oil/gas-related OCS activities.

Sensitive offshore area - An area containing species, populations, communities, or assemblages of living resources, to which normal oil and gas exploration and development activities may cause irreparable damage, including interference with established ecological relationships.

Shunting - A method used in offshore oil and gas drilling activities where expended drilling cuttings and fluids are discharged near the ocean seafloor rather than at the surface, as in the case in normal offshore drilling operations.

Single point mooring (SPM) - Offshore anchoring and loading or unloading point connected to shore by an undersea pipeline. Used in areas where existing harbors are not deep enough for laden tankers.

Sour gas - Natural gas contaminated with chemical impurities, notably hydrogen sulphide or other sulphur compounds, which impart to the gas a foul odor. Such compounds must be removed before the gas can be used for commercial and domestic purposes.

Sour oil - Crude oil containing significant quantities of hydrogen sulphide gas.

Spill - A sudden, unintentional, or accidental unplanned release of oil.

Stratigraphic trap - A geologic feature that includes a reservoir, capable of holding oil or gas, that is formed from a change in the character or extent of the reservoir rock. Such a trap is harder because it is not dependent on structural closure and is thus not readily revealed by geological or geophysical surveys.

Subsea completion - A self-contained unit to carry men from a tender to the ocean bottom and enable them to install, repair, or adjust wellhead connections in a dry, normal atmosphere.

Subsea complex - A development well in which the assembly of valves, pipes, and fittings used to control the flow of oil or gas is located on or near the ocean floor.

Subsidence - A sinking of a large part of the earth's crust.

Subsistance uses - The customary and traditional uses by rural Alaska residents of wild, renewable resources of direct personal or family consumption as food, shelter, fuel, clothing, tools, or transportation; for making and selling of handicraft articles out of nonedible byproducts of fish and wildlife resources taken for personal or family consumption; for barter, or sharing for personal or family consumption; and for customary trade.

Subtidal - generally considered to be that part of the ocean bottom not uncovered by tidal action.

Summary report - A document prepared by the Department of the Interior pursuant to 30 CFR 252.4 that is intended to inform affected state and local governments as to current OCS reserve estimates, projections of magnitude and timing of development, transportation planning, and general location and nature of nearshore and onshore facilities.

Supply boat - A vessel that ferries food, water, fuel, and drilling supplies and equipment to a rig and returns to land with refuse that cannot be disposed of at sea.

Sweet crude - Crude oil containing very little sulfur or sulfur compounds.

Sweet gas - Natural gas free of significant amounts of hydrogen sulfide (H_2S) when produced.

Threatened - refers to any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range and has been officially listed by the appropriate Federal agency; criteria for determination of threatened status can be found under "endangered".

Total suspended solids (TSS) - The total content of suspended and dissolved solids in water.

Trawl - a large, tapered fishing net of flattened, conical shape that is typically towed along the sea bottom.

Trophic - feeding, trophic levels refer to the hierarchy of organisms from photosynthetic plants to carnivores such as man.

Turbidity - Reduced water clarity resulting from the presence of suspended matter.

Ultra-large crude carrier (ULCC) (sometimes called a supertanker) - A tanker in excess of 300,000 dead weight tons.

Undiscovered resources - Quantities of oil and gas estimated to exist outside known fields.

Unexposed Coastline - That shoreline bordered by sheltered waters, particularly where an embayment creates a calmer sea state. Direct exchange of seawater is limited by coastal inlets of about two or less miles across.

Unit - Administrative consolidation of OCS leases held by one or more companies but explored, developed, and/or produced as one lease by one operator for purposes of conservation, eliminating unnecessary operations, and/or maximizing resources recovered.

Upwelling - movement of subsurface water to the surface of the ocean, caused by meteorological and physical phenomena.

Value added - for a given enterprise, the market price of goods completed, less the cost of purchased materials. Gross value added includes compensation to employees, profits, taxes, rents, interest, and reserves for depreciation.

Vascular plants - Plants containing food and water conducting structures; higher plants which reproduce by seeds.

Very large crude carrier (VLCC) - A crude oil tanker of 160,000 dead weight tons or larger, capable of carrying one million barrels or more.

Vulnerability - The likelihood of being damaged by external influences. Vulnerability implies sensitivity of a system plus the risk of a damaging influence occurring.

Water Test Areas - Areas established by DOD where research, development, and the testing of military planes, ships, and weaponry takes place.

Weathering - The aging of oil due to its exposure to the atmosphere causing marked alterations in its physical and chemical makeup.

Wetlands - Areas periodically inundated or saturated by surface or groundwater and supporting predominantly vegetation typically adapted for life in saturated soil conditions.

Xenobiotic - compound not usually associated with living organisms.

Zooplankton - animal plankton, dependent on phytoplankton for food source.

APPENDIX E
Abbreviations and Acronyms

ABBREVIATIONS AND ACRONYMS

ACAA	Alabama Coastal Area Act of 1976
ACAMP	Alabama Coastal Area Management Program
ACMI	Air Combat Maneuvering Instrumentation
AEMA	Alabama Environmental Management Act
AFB	Air Force Base
AALRS	Alaska Automated Land Records System
AAPG	American Association of Petroleum Geologists
AAQS	Ambient Air Quality Standards
ABSORB	Alaska Beaufort Sea Oilspill Response Body
ACMA	Alaska Coastal Management Act
ACMP	Alaska Coastal Management Program
ACORP	Alaska Cooperative Oilspill Response Planning Committee
ADF&G	Alaska Department of Fish and Game
AEIDC	Arctic Environmental Information and Data Center
AEWC	Alaska Eskimo Whaling Commission
AMSA	area meriting special attention
ANCSA	Alaska Native Claims Settlement Act
ANILCA	Alaska National Interest Lands Conservation Act
ANS	Alaska North Slope Crude Oil
ANWR	Arctic National Wildlife Refuge
AOGA	Alaska Oil and Gas Association
APFRT	American Peregrine Falcon Recovery Team
APD	Application for Permit to Drill
API	American Petroleum Institute
APR	areas for preservation and restoration
AQCR	Air Quality Control Regions
ARTC	Armament Research and Test Center
AS	Alaska statute
ASBS	areas of special biological significance
ASHA	Alaska State Housing Authority
ASRC	Arctic Slope Regional Corporation
AVCP	Association of Village Council Presidents
BAST	Best Available and Safest Technology
bbls	barrels
Bbbls	billion barrels
BBO	billion barrels of oil
bcd	barrels per calendar day
bsd	barrels per stream-day
BCDC	Bay Conservation and Development Commission
Bcf	billion cubic feet
b/d	barrels per day
BIA	Bureau of Indian Affairs
BLM	Bureau of Land Management
BMR	Bureau of Marine Resources
BOD	biological oxygen demand
B.P.	before present
BTF	Biological Task Force
Btu	British thermal unit
CalCOFI	California Cooperative Oceanic Fisheries Investigations
CARB	California Air Resources Board
CCA	California Coastal Act
CCC	California Coastal Commission

CCW	Clean Coastal Waters (CA oil spill cleanup cooperative)
CD	Conservation Division
CDFG	California Department of Fish and Game
CDI	coastal dependent industry
CDOG	California Division of Oil and Gas
CEIP	Coastal Energy Impact Program
CEP	Council of Environment Protection
CEPEX	Controlled Ecosystem Pollution Experiment
CEQ	Council on Environmental Quality
CER	categorical exclusion review
CERCLA	Comprehensive Environmental Compensation and Liability Act
CETA	Comprehensive Employment and Training Act
cf	cubic feet
CFR	Code of Federal Regulations
cm	centimeter
cm^2	square centimeter
cm^3	cubic centimeter
CMP	coastal management program
COD	chemical oxygen demand
COE	Corps of Engineers
COG	Councils of Government
COPRDM	Committee on Ocean Pollution Research, Development, and Monitoring
CPA	Central Planning Area
CPC	Coastal Policy Council (St of AK)
CRSA	coastal resource service area
CSI	Clean Seas Incorporated (CA oil spill cleanup cooperative)
CSLC	California State Lands Commission
CZM	Coastal Zone Management
CZMA	Coastal Zone Management Act
dBa	decibels audible
DEC	Department of Environmental Conservation
DECA	Department of Economic and Community Affairs
DEIS	draft environmental impact statement
DEM	Department of Environmental Management
DM	Departmental Manual
DMA	Defense Mapping Agency
DNR	Department of Natural Resources
DOC	Department of Commerce
DOCD	Development Operations Coordination Document
DOD	Department of Defense
DOE	Department of Energy
DOI	Department of the Interior (also: USDI)
DOJ	Department of Justice
DOT	Department of Transportation
DOTPF	Department of Transportation and Public Facilities
DPP	Development and Production Plan (POD)
dwt	dead weight ton
EA	environmental assessment
E&D	Exploration and Development Report
ECA	Eastern Coastal Area
EDA	Economic Development Administration
EEZ	Exclusive Economic Zone
EIS	environmental impact statement
EPA	Environmental Protection Agency (Also: USEPA) or Eastern Planning Area

ER	Environmental Report
ESA	Endangered Species Act
ESI	Environmental Sensitivity Index
ESP	Environmental Studies Program
EOR	enhanced oil recovery
EWC	Eskimo Whaling Commission
FAA	Federal Aviation Administration
FACSFAC	Fleet Area Control and Surveillance Facility
FCMA	Fishery Conservation and Management Act of 1976
FCMP	Florida Coastal Management Program
FEIS	final environmental impact statement
FERC	Federal Energy Regulatory Commission
FIRE	finance, insurance, and real estate
FIRS	Failure and Inventory Reporting System
FMP	Fishery Management Plan
FONSI	finding of no significant impact
FR	Federal Register
ft	foot
FWPCA	Federal Water Pollution Control Act
FWS	Fish and Wildlife Service
FY	fiscal year
GAPC	Geographic Areas of Particular Concern
GIS	Geographic Information System
GIWW	Gulf Intracoastal Waterway
GS	Geological Survey (also: USGS)
ha	hectare
HAPC	Habitat Area of Particular Concern
hr	hour
HUD	Department of Housing and Urban Development
ICAS	Inupiat Community of the Arctic Slope
IPF	impact producing factor
IPHC	International Pacific Halibut Commission
IPP	Intergovernmental Planning Program
IRA	Indian Reorganization Act
ITL	Information to Lessees
IWC	International Whaling Commission
kg	kilogram
km	kilometer
km^2	square kilometer
kW	kilowatt
l	liter
lbs	pounds
LCP	Local Coastal Programs
LCRP	Louisiana Coastal Resources Program
LNG	liquified natural gas
LOOP	Louisiana Offshore Oil Port, Inc.
LUMCON	Louisiana Universities Marine Consortium
m	meter
m^2	square meter
m^3	cubic meter
M	thousand
MAFLA	Mississippi, Alabama, Florida
maxi.	maximum
Mbbls	thousand barrels

MBD	thousand barrels per day
MCP	Mississippi Coastal Program
MERL	Marine Ecosystems Research Laboratory
MPRSA	Marine Protection Research and Sanctuaries Act of 1972
mg	milligrams
mgd	million gallons per day
mi	mile
MIRG	Marine Industry Group
mm	millimeter
MM	million
MMbbls	million barrels
MMcf	million cubic feet
MMcfd	million cubic feet per day
MMPA	Marine Mammal Protection Act
MMS	Minerals Management Service
MODU	mobile drilling unit
MW	megawatt
MSY	maximum sustained yield
MT	metric ton
MWe	megawatt (electric)
MOU	Memorandum of Understanding
NAAQS	National Ambient Air Quality Standards
NAS	National Academy of Sciences
NASA	National Aeronautics & Space Administration
NCP	National Contingency Plan
NCSC	Naval Command System Center
NEPA	National Environmental Policy Act
NERBC/RALI	New England Rivers Basins Commission/Resources and Land Investigations Program
ng	nannogram
NGPA	Natural Gas Policy Act
NHPA	National Historic Preservation Act
NMFS	National Marine Fisheries Service
nmi	nautical mile
NMRC	National Maritime Research Center
NOAA	National Oceanic and Atmospheric Administration
NOS	National Ocean Survey
NPDES	National Pollution and Discharge Elimination System
NPFMC	North Pacific Fisheries Management Council
NPS	National Park Service
NRHP	National Register of Historic Places
NRT	National Response Team
NSF	National Science Foundation
NTL	Notice to Lessees
ODMDS	Ocean Dredged Material Disposal Site
OBERS	Office of Business Economics and the Economic Research Service (OBE-Dept. of Commerce) (ERS-Dept. of Agriculture)
OCRM	Office of Ocean and Coastal Resource Management
OCS	outer continental shelf
OCSEAP	Outer Continental Shelf Environmental Assessment Program
OCSLA	Outer Continental Shelf Lands Act
OEI	Offshore Ecology Investigation
OMB	Office of Management and Budget (St of AK)
ORCA	Office of Ocean Resources Coordination and Assessment
OSC	on-scene coordinator

OSRA	Oil Spill Risk Analysis
OSRAM	Oil Spill Risk Analysis Model
OS&T	Offshore Separation and Treatment
OTEC	Ocean Thermal Energy Conversion
OWOCRS	Open Water Oil Containment and Recovery System
OY	optimum yield
OCMP	Oregon Coastal Management Plan
ODFW	Oregon Department of Fish and Wildlife
ODSL	Oregon Division of State Lands
ODLCD	Oregon Department of Land Conservation and Development
ODEQ	Oregon Department of Environmental Quality
PG&E	Pacific Gas & Electric Company
PGT	Pacific Gas Transmission Company
PI	principal investigatory
P.L.	Public Law
PMTC	Pacific Missile Test Center
POCS	Pacific Outer Continental Shelf
POD/P	Plan of Development and Production
ppb	parts per billion
pphm	parts per hundred million
ppm	parts per million
ppt	parts per thousand
PSD	Prevention of Significant Deterioration
PTC	Petroleum Transportation Committee
RAG	Resource Appraisal Group
RDA	Rural Development Assistance
REAA	Regional Education Attendance Area
RIMS	Regional Industrial Multipler System
RM	Regional Manager
RPC	Regional Planning Council
RPI	Resource Planning Institute, Inc.
RRT	Regional Response Team
RS	Regional Supervisor
RSOFO	Regional Supervisor, Offshore Field Operations
RTWG	Regional Technical Working Group
RU	Research Unit
SALM	Single Anchor Leg Mooring System
SBC	Santa Barbara Channel
SEL	Site Evaluation List
SESP	Socioeconomic Studies Program
SHPO	State Historical Preservation Office/Officer
SIC	Standard Industrial Classification
SID	Secretarial Issue Document
SLO	San Luis Obispo
SMA	Special Management Area
SMSA	Standard Metropolitan Statistical Area
sp.	species
SPR	Strategic Petroleum Reserve
SSL	Scientific Support Coordination
stat	statute
tcf	trillion cubic feet
TAPS	Trans-Alaska Pipeline System
TDS	total dissolved solids
TEOR	Thermally Enhanced oil recovery

TMP	transportation management plan
TSP	total suspended particulates
ug	microgram
ULCC	Ultra large crude carrier
USAF	U.S. Air Force
U.S.C.	United States Code
USCG	U.S. Coast Guard
USDC	U.S. Department of Commerce
USDI	U.S. Department of the Interior (also: DOI)
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey (also: GS)
VLCC	very large crude carrier
VOC	volatile organic compounds
WPA	Western Planning Area
WSMC	Western Space and Missile Certer

APPENDIX F
Environmental Studies

The Minerals Management Service
Environmental Studies Program

Fiscal Year 1984 Program Summary

April 1985

Prepared by

James M. Cimato
Branch of Environmental Studies
Offshore Environmental Assessment Division
Minerals Management Service
Washington, D.C. 20240

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   - Program Quality Assurance
   - Lease Sale Studies
   - Program Accomplishments
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2. Atlantic OCS Regional Studies Program
   - Program Rationale
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3. Gulf of Mexico OCS Regional Studies Program
   - Program Rationale
   - Program Accomplishments
   - Program Timelines
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4. Pacific OCS Regional Studies Program
   - Program Rationale
   - Program Accomplishments
   - Program Timelines
   - Funding
   - Regional Program Contacts
5. Alaska OCS Regional Studies Program
   - Program Rationale
   - Program Accomplishments
   - Program Timelines
   - Funding
   - Regional Program Contacts

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PREFACE

The Department of the Interior's Minerals Management Service (MMS) conducts the Environmental Studies Program in support of oil and gas development activities on the outer continental shelf (OCS) with current funding obligations of approximately $26 million. This report provides a brief overview of the Environmental Studies Program activities and accomplishments during Fiscal Year (FY) 1984. All statements regarding numbers of projects, rigs in place, sales, etc. are based on conditions as of September 31, 1984 unless otherwise noted. Information contained in this report has been drawn from reports and planning documents generated in the MMS Regions and from conversations with Regional and Washington Office staff. To assist the reader who is interested in more detailed Region-specific or project-level information, a bibliography is provided.

SECTION I

INTRODUCTION

Mission Statement

Subsequent to the passage of the Outer Continental Shelf (OCS) Lands Act of 1953 (67 Stat 462), the Secretary of the Interior designated the Bureau of Land Management (BLM) as the administrative Agency for leasing submerged Federal lands and the U.S. Geological Survey for supervising development and production. In May 1982, all Department of the Interior leasing and resource management functions for the OCS were consolidated within the Minerals Management Service (MMS).

As stated in the OCS Lands Act Amendments of 1978 (PL 95-372), the four major goals for the comprehensive management of OCS minerals are:

(1) To ensure orderly development of the marine mineral resources to meet the energy demands of the Nation.

(2) To provide for protection of the human, marine, and coastal environments concomitant with mineral resource development.

(3) To provide for receipt of a fair market value for the leased mineral resources.

(4) To preserve and maintain free enterprise competition.

To meet goal (2) above, and to meet information and administrative requirements of the National Environmental Policy Act of 1969, environmental costs and multiple use conflicts are assessed through the preparation of environmental impact statements for leasing/development activities. Additionally, a nationwide OCS Environmental Studies Program was initiated by BLM (now MMS) in 1973 to provide additional environmental information and analysis on marine and coastal ecosystems and to seek to establish benchmark environmental conditions in all OCS areas for future identification of alterations caused by OCS activities.

Objectives

The objective of the OCS Environmental Studies Program is to "establish information needed for prediction, assessment, and management of impacts on the OCS and the nearshore area which may be affected . . ." (43 CFR 3001.7). The studies are designed to:

(1) Provide information on the status of the environment upon which the prediction of the impacts of OCS oil and gas development may be based.

(2) Provide information on the ways and extent that OCS development can potentially impact the human, marine, biological, and coastal area.

(3) Ensure that information already available or being collected under the program is in a form that can be used in the decisionmaking process associated with a specific leasing action or with the longer term OCS mineral management responsibilities.

(4) Provide a basis for future monitoring of OCS operations.

The purpose of the studies program is to ensure that the environmental information on which decisions are based is the most definitive that can be assembled at the time.

Minerals Management Service Organization

The organization chart for the MMS is shown in Figure I-1. The Environmental Studies Program is managed in the Washington Office by the Branch of Environmental Studies located within the Offshore Environmental Assessment Division. Environmental Studies Sections within the four Regional Offices are responsible for managing environmental studies within their respective areas of jurisdiction. These areas include (see Figure I-2):

- Atlantic Region--North, Mid- and South Atlantic
- Gulf of Mexico Region--Western, Central and Eastern Gulf of Mexico
- Pacific Region--Southern, and Central and Northern California
- Alaska Region--Gulf of Alaska, Bering Sea, and Arctic Subregions

Formal communication between the Regions and the Washington Office is through the Associate Director for Offshore Minerals Management. The Branch of Procurement Operations, located within the Procurement and General Services Division, provides procurement support to the Environmental Studies Program.

Coordination with other Agencies

The MMS has complete responsibility for the multi-year process leading to lease sales, and for adequately assessing the leasehold operations that follow. The U.S. Fish and Wildlife Service participates in the OCS leasing and development process regarding the management and use of the Nation's fish and wildlife resources and their habitats as well as implementation of the Endangered Species Act.

Other Federal Agencies have regulatory responsibilities on the OCS. The Corps of Engineers and the U.S. Coast Guard have responsibility for decisions regarding impediments to navigation. The National Marine Fisheries Service has the responsibility for implementation of the Fisheries Conservation and Management Act, the Marine Mammal Protection Act and the Endangered Species Act. Interaction with these Agencies on a regular basis is required for solicitation of expert advice, information sharing, and joint planning of programs. Pursuant to the terms of the OCS Lands Act Amendments of 1978 the MMS entered into a Basic Agreement with the National Oceanic and Atmospheric Administration (NOAA). As a result of this Agreement, NOAA manages specified studies in the Alaska Region as directed by the MMS. On May 31, 1984 a Memorandum of Understanding (MOU) was executed between the Secretary of the Interior and the Administrator of the Environmental Protection Agency (EPA). The MOU provides for the two agencies to coordinate studies and related regulatory responsibilities concerning environmental permits for oil and gas activities on the Outer

MINERALS MANAGEMENT SERVICE

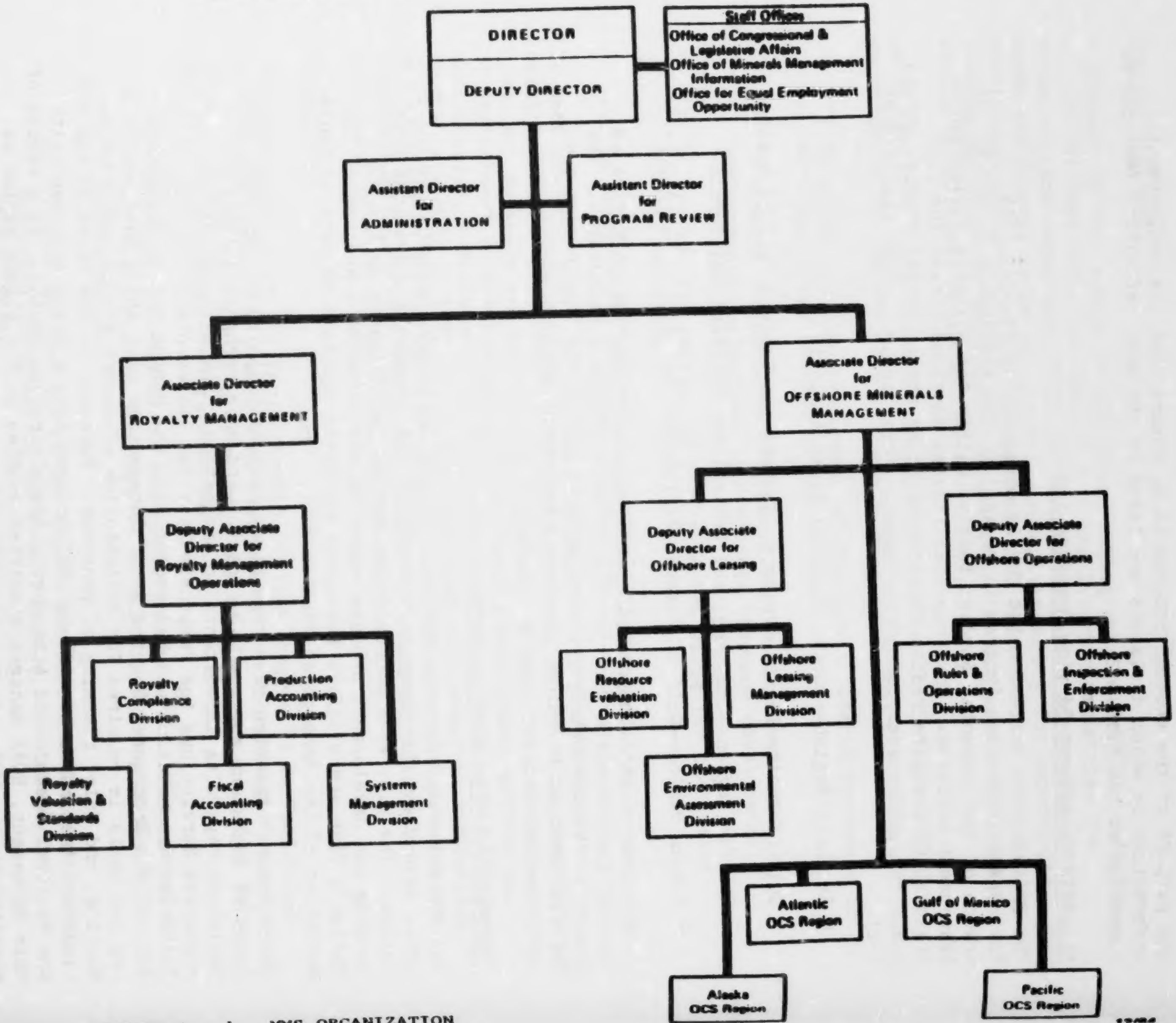

DIRECTOR
DEPUTY DIRECTOR
Staff Offices
Office of Congressional & Legislative Affairs
Office of Minerals Management Information
Office for Equal Employment Opportunity
Assistant Director for ADMINISTRATION
Assistant Director for PROGRAM REVIEW
Associate Director for ROYALTY MANAGEMENT
Associate Director for OFFSHORE MINERALS MANAGEMENT
Deputy Associate Director for Royalty Management Operations
Royalty Compliance Division
Production Accounting Division
Royalty Valuation & Standards Division
Fiscal Accounting Division
Systems Management Division
Deputy Associate Director for Offshore Leasing
Offshore Resource Evaluation Division
Offshore Leasing Management Division
Offshore Environmental Assessment Division
Deputy Associate Director for Offshore Operations
Offshore Rules & Operations Division
Offshore Inspection & Enforcement Division
Atlantic OCS Region
Gulf of Mexico OCS Region
Alaska OCS Region
Pacific OCS Region

FIGURE I-1. MMS ORGANIZATION

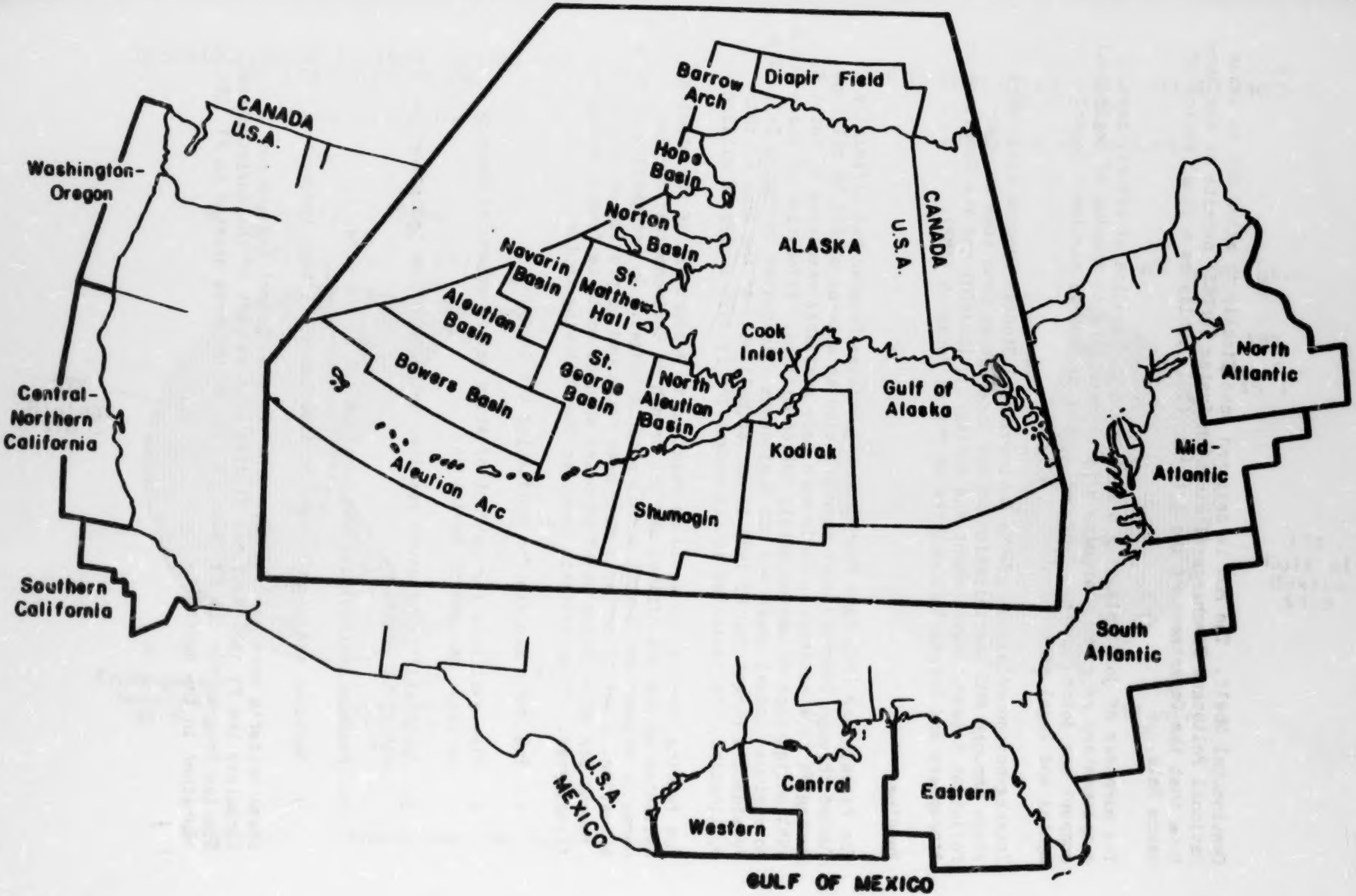

Barrow Arch
Diapir Field
Hope Basin
Norton Basin
Navarin Basin
St. Matthew-Hall
Aleutian Basin
St. George Basin
North Aleutian Basin
Bowers Basin
Aleutian Arc
Shumagin
Kodiak
Cook Inlet
Gulf of Alaska
ALASKA
U.S.A.
CANADA
CANADA
U.S.A.
Washington-Oregon
Central-Northern California
Southern California
North Atlantic
Mid-Atlantic
South Atlantic
U.S.A.
MEXICO
Western
Central
Eastern
GULF OF MEXICO

FIGURE I-2. OCS Lease Sale Planning Areas

Continental Shelf. The MOU is designed specifically to allow EPA to issue National Pollutant Discharge Elimination System (NPDES) permits at the same time that the Department of the Interior (DOI) publishes a final Notice of Lease Sale.

The purposes of joint planning are to avoid duplication of effort, develop complementary programs, maximize efforts resulting in sharing of logistical support and joint funding of projects, and to observe pertinent departmental and legal requirements.

Interagency coordination of the Environmental Studies Program also takes place through MMS participation on the Interagency Committee on Ocean Pollution Research Development and Monitoring (COPRDM) and the Committee on Atmosphere and Oceans Subcommittee on Marine Research (SMR).

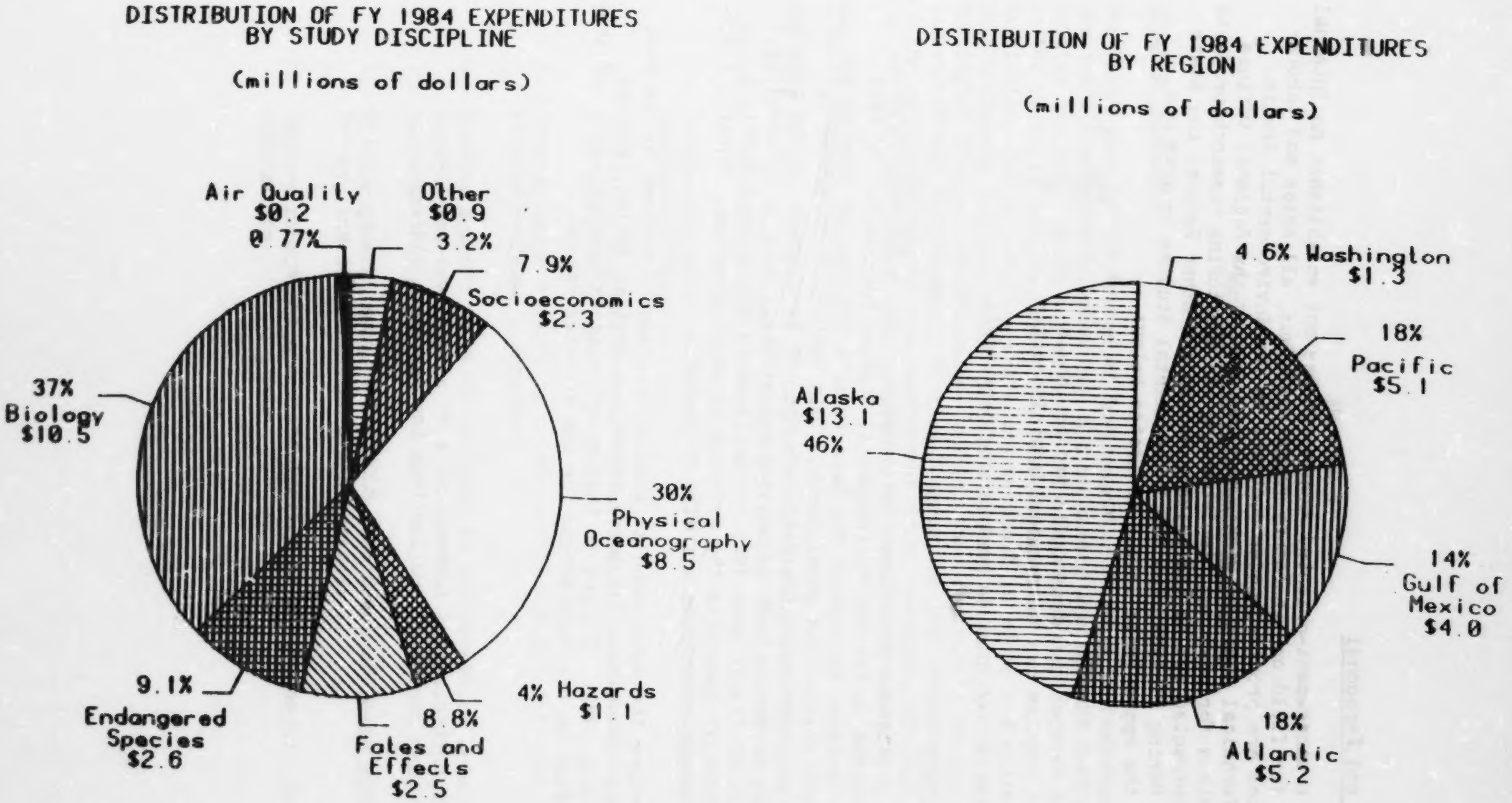
Funding

The Fiscal Year (FY) 1984 Environmental Studies Program was officially funded through Congressional appropriation at a level of $27.88 million. During FY 1984 additional funds were made available resulting in total FY 1984 obligations of approximately $28.66 million. Allocation of these funds to various topical areas and OCS Regions is illustrated in Figure I-3. The President's budget for FY 1985 is $27.88 million. At the time of this publication, the estimated actual budget for FY 1985 is $26.08 million.

The funding level which would be required to support all of the studies requested by the OCS offices and the Branch of Environmental Studies normally exceeds the actual annual program budget. In recognition of this situation, a set of criteria have been developed to provide an orderly process for determining which proposed studies would be funded during any fiscal year. These criteria consider the following topics:

1. The MMS's mandate for conducting the study.
2. Time available for conduct of study before scheduled leasing or lease management decisions.
3. Applicability of study results, methodology, or technology to other OCS areas.
4. Present availability and completeness of the data.
5. Regional and/or programmatic importance of study issue.

These criteria were used to determine regional priorities and to formulate the FY 1984 National Studies List as part of the Environmental Studies Program for the FY 1984. A list of projects started in FY 1984 is contained in the Appendix.



DISTRIBUTION OF FY 1984 EXPENDITURES BY STUDY DISCIPLINE

(millions of dollars)

DISTRIBUTION OF FY 1984 EXPENDITURES BY REGION

(millions of dollars)

FIGURE I-3. Fiscal Year 1984 Expenditures

Facilities and Personnel

The MMS is a management-oriented Agency and has not established an internal capability for field or laboratory research. Thus, all ships and laboratory services are provided under contract in the Environmental Studies Program. Technical staff in Washington and each of the Regional Offices are responsible for planning, implementing and monitoring research projects that are contracted out to the private sector and other Federal and State Agencies. During FY 1984, the MMS Environmental Studies Program was staffed at the approximate levels indicated below:

	FTE
Scientific professionals	35
Secretarial/administrative	6

These figures do not include contracting personnel.

Current Studies

Section II provides a brief overview of some of the major environmental studies included in the MMS Environmental Studies Program for FY 1984 which were designed to support the Department's OCS leasing program for petroleum exploration and development. This section is presented by office. A description of the rationale for the development of the program is presented in the context of leasing activities. This is followed by a presentation of fiscal year 1984 accomplishments and program timelines which graphically indicates the duration of major programs. Funding information and program contacts are also indicated.

The MMS revises its environmental studies programs to respond to the most current lease schedule. The lease schedule effective during 1984 was issued in July 1982. Changes to that schedule occassionally occur and they are identified in the discussions for the affected Region.

SECTION II

PROGRAM DESCRIPTIONS

Washington Office Studies Program

Program Rationale

The Washington Office Branch of Environmental Studies is responsible for the overall management, planning, and budgeting for the MMS Environmental Studies Program. While the majority of studies are implemented and managed in the regional offices, many have been implemented and managed by the Washington Office. Studies which are national in scope and address issues that transcend regional differences are typically initiated in the Washington Office. Additionally, studies that contribute to the overall quality of the Environmental Studies Program, or that enhance the quality of the decisions made in the development of a consistent national policy for oil and gas leasing, are components of the Washington Office effort.

Program Quality Assurance

The goal of this program is to maintain the quality of science and data synthesis in the Environmental Studies Program. Major objectives of this program in 1984 include:

1. Curate biological specimens from OCS studies through the Smithsonian Institution;
2. Conduct a national hydrocarbon chemistry intercalibration and methodology development program;
3. Provide major support to scientists to publish data and findings in peer-reviewed literature;
4. Provide support to major conferences and workshops oriented towards the development of a fundamental understanding of oceanographic processes and applications to impact assessment;
5. Provide general support to UNOLS, NAS Board of Ocean Science and Policy, and other similar organizations;
6. Improve management and dissemination of environmental studies information.

Lease Sale Studies

The goal of this program is to provide generic and sale specific analyses in support of the Secretary's lease schedule. Major components include:

1. Assessment of marine productivity among OCS planning areas
2. Development of bathymetric maps.

Program Accomplishments

The Washington Office currently manages 36 projects which are described in detail in the Catalog for Federal Ocean Pollution Programs. Following is a brief summary of accomplishments and findings during FY 1984.

During 1983 a workshop was cosponsored with the Environmental Protection Agency to apply the adaptive environmental assessment methodology to the issue of environmental impacts associated with drilling muds and cuttings discharged on benthic communities. A simulation model was developed which combines a simulation of physical transport with that of biological effects. A report was issued in 1984 which reaffirmed the dependency of the fates and potential effects of drilling muds on the composition of the mud and environmental factors such as water depth, current direction and sediment disturbance regimes as well as biological factors associated with intrinsic growth rates.

A project was initiated to evaluate the potential of lignin analysis of marine sediments as a monitoring methodology for the presence of drilling fluids. To evaluate the methodology, sediment samples from most of the OCS areas will be analyzed and results will be compared with existing knowledge of lignin monomer compositions in lignosulfonates (which are frequently used in drilling fluids). Minimum detectable inputs of lignosulfonates (and therefore drilling muds) will be determined for different OCS regions. This project is scheduled for completion in 1985.

During FY 1984 work continued on the development of technical summaries for all projects funded through the Environmental Studies Program since 1973. The summaries will provide, in 3-4 pages, a description of the purpose, objectives, technical approach and significant conclusions or findings for each project. Final technical summaries for 125 projects are scheduled for completion early in 1985. This effort will continue until the results of all past projects have been summarized.

During FY 1983, under a Cooperative Agreement with MMS, the University of Maryland Eastern Shore undertook a study to compare the relative marine productivity and environmental sensitivity of all OCS planning areas. In the first phase of the study, literature on marine productivity was reviewed to compile all available information on the marine and coastal habitats and biota of the OCS planning areas. The final report for the first phase is due in FY 1985. The second phase of the project (year 2 and 3) will evaluate all published and unpublished information dealing with the construction of oil spill environmental sensitivity indices and will produce an assessment of relative sensitivity for each of the OCS planning areas. Also during 1984 14 bathymetric maps and topographic-bathymetric maps were prepared for leasing activities in the OCS Regions. Trends for FY 1985 and 1986 indicate that the mapping activity will be concentrated primarily in Alaska.

Funding (in thousands of dollars)

FY 1983	FY 1984	FY 1985*
$1,856	$1,304	$2,630

* Estimated

Regional Program Contacts

Primary responsibilities (as of February 1985) are indicated for the Washington, D.C., office program management staff in the Branch of Environmental Studies:

Dr. Don Aurand, Chief, Branch of Environmental Studies

Dr. Thomas Ahlfeld--Pacific OCS Studies

Mr. Thomas Burke--Atlantic and Gulf of Mexico OCS Studies

Mr. James Cimato--Fates and Effects Program

Mr. Norman Hurwitz--'Lower 48' Socioeconomic Program

Dr. William Lang--Endangered Species Program

Ms. Nancy Prolman--Alaska Socioeconomic Program

Mr. Frederick Sieber--Alaska OCS Studies

Mr. Hawley Thomas--Program Analyst

Branch of Environmental Studies
Minerals Management Service (644)
Washington, D.C. 20240
Telephone: (202) 343-7744

ATLANTIC OCS REGIONAL STUDIES PROGRAM

The Atlantic OCS Region is bounded on the north by the U.S./Canadian border and extends southward to approximately 27 degrees N latitude. For leasing purposes, the region is divided into the North, Mid- and South Atlantic planning areas. The FY 1984 Regional Studies Plan, which provides detailed rationale and planning information for the region's FY 1984 program was based on the July 1982 Final 5-Year OCS Oil and Gas Leasing Schedule, with attendant changes in sale dates.

The area sales on the July schedule, with changes that took place through 1984, include:

Planning Area	Sale Number	Proposed Sale Date
North Atlantic	52	October 1982 (cancelled)
	82	September 1984 (cancelled 9/84)
	96	September 1986 (on hold)
Middle Atlantic	76	April 1983
	111	October 1985
South Atlantic	78	July 1983
	90	July 1985 (on hold)
	108	January 1987

Program Rationale

Eight sales have been held in the Atlantic OCS Region along with one reoffering sale which included tracts from the Atlantic as well as other OCS Regions. To date, limited exploration has taken place in each of the three planning areas in Atlantic.

The Atlantic Region Program has been designed in the context of developing an understanding of the dominant physical and biological processes in the area. This information is applied to leasing management decisions including the development of mitigating measures. These studies are intended to facilitate development activities, should they occur.

The principal goals of this regional program are to:

1. Determine the short and long-term impacts of drilling and development operations on biological communities;
2. Describe the distribution, abundance, migration routes, timing of migration and habitat identification and utilization by endangered species; and characterize other living marine resources to assess the potential impacts resulting from oil and gas activities;

3. Understand physical processes and transport mechanisms of drilling effluents especially in deep water on the continental slope and rise;

4. Identify potential impacts to benthic communities in deep water environments.

The following objectives have been implemented, or were active as specific projects, through the Atlantic Regional Office in FY 1984.

1. Endangered Species--determine the effects of noise and oil components on cetaceans; identify marine mammal and turtle populations, habitats and migration routes; determine effects of oil on turtles.

2. Georges Bank Monitoring--determine long-term effects of drilling operations on benthic communities near-field and regionally.

3. Pollutant Transport--characterize sediment transport and other physical processes on North and Mid-Atlantic continental slope, rise and submarine canyons. Determine general circulation features and their variability along the Mid-Atlantic slope/rise; determine influence of Gulf Stream on general circulation patterns. Characterize near-bottom and mid-water current regimes over the Blake Plateau; continue long-term, multi-level circulation measurements, collection and analysis of surface forcing data, meteorologic data, and monitoring of Gulf Stream pertubations.

4. Marine Ecosystems--characterize potentially vulnerable organisms and habitats on the North, Mid, and South Atlantic Continental Slope and Rise. Examine the biological processes in the submarine canyons and adjacent slopes in the North/Mid-Atlantic to determine how OCS drilling may affect potentially sensitive benthic communities. Characterize benthic and nektonic communities associated with live bottom areas in the South Atlantic, and evaluate the importance of live bottom habitats to offshore fisheries.

A detailed rationale for the Atlantic OCS Regional Studies Program can be found in the Regional Studies Plan for the Atlantic Outer Continental Shelf, which is prepared annually.

Program Accomplishments

The Atlantic OCS Regional Studies Program is comprised of 15 active projects which are described in detail in the Catalog for Federal Ocean Pollution Programs. Following is a brief topical summary of accomplishments and findings during FY 1984.

- Endangered Species: This year's results from the "Study of the Effects of Oil on Marine Mammals" (1979 - 1985) indicate that dolphins can detect and avoid oil slicks, but have more difficulty detecting oil sheens. It was also found that oil has only minor effects on baleen, and that cetacean skin provides an effective barrier to hydrocarbons. This study has also produced promising preliminary results in the development of a radio tag for large cetaceans.

  A multi-year study, begun in 1983 and cosponsored with the Gulf of Mexico Region Office, has conducted a series of laboratory experiments to determine whether marine turtles are attracted to oil slicks and tar balls. The investigators are also examining the physiological effects of oil exposure and ingestion by the turtles.

- Georges Bank Monitoring: This major program was begun in 1981 to monitor changes in the biological, sedimentalogical and chemical properties in the benthic environment before, during and after exploratory drilling activities and to determine whether changes were caused by the drilling activity. Another objective was to determine the fate of the discharged materials. Reports have been produced annually which characterize seasonal and spatial variability in the benthic environment. Results to date indicate no significant biological impacts associated with exploratory drilling. Barium was found to be a good tracer of drilling mud because of the low background concentrations found on Georges Bank. The high energy of the Georges Bank environment tended to disperse drilling discharges widely. Field work in this program concluded in 1984 and a final report is scheduled for 1985.

- Pollutant Transport: A program studying canyon and slope processes in the North and Mid-Atlantic (1980 - 1985) is in its final year of data synthesis and the preparation of a final report. Canyon dynamics and faunal assemblages were studied in the Baltimore and Lydonia Canyons. Slope areas studied were: 1) between Lindenkohl and Carteret Canyons; 2) between Toms and Meys Canyons; and 3) between Veatch and Hydrographer Canyons.

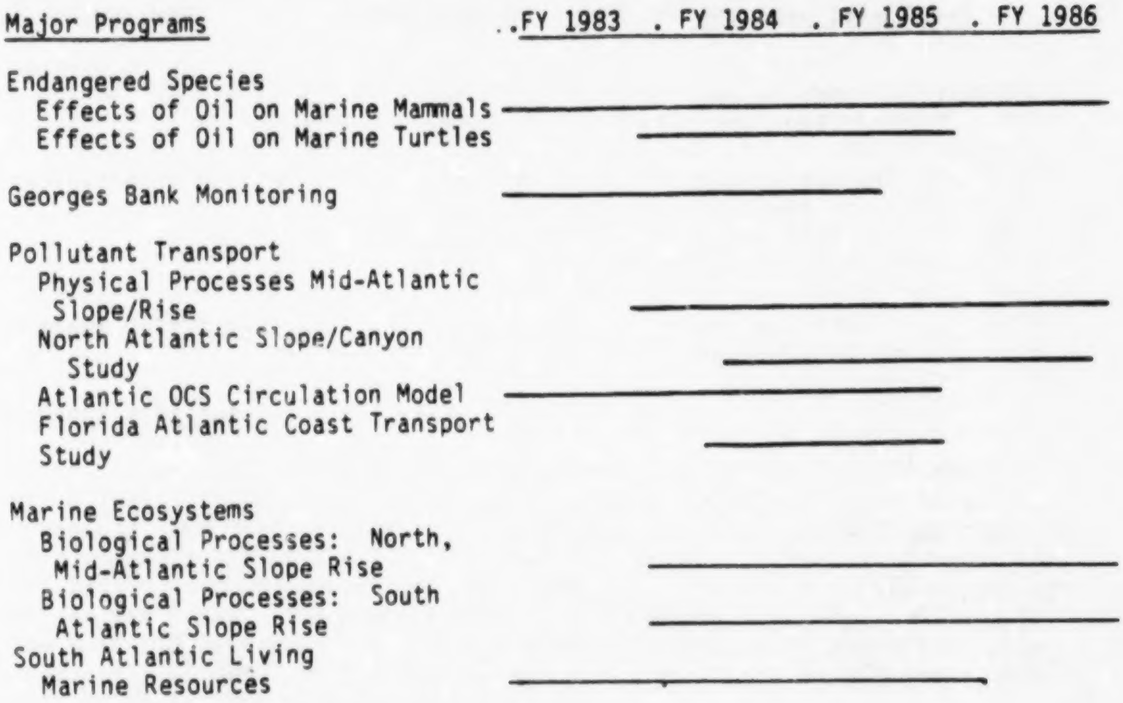
  A 3-year physical oceanography program (1983 - 1986) on the Mid-Atlantic continental slope and rise is to study continuing circulation patterns and define variability in this area.

- Marine Ecosystems: A major program to study biological processes on the North, Mid- and South Atlantic Continental Slope and Rise (1983 - 1987) has been initiated in each planning area. The North and South Atlantic studies focus on benthic characterization, while the Mid-Atlantic study is a rig-monitoring program.

The final report for the third year of live bottom studies in the South Atlantic (1981 - 1985) has been received, and scientific publications are in preparation. This study evaluates factors (depth, latitude, season, etc.) which influence community structure, and describes food habits of selected fishes. It also assesses the potential impacts of oil and gas activities on a live bottom community.

Program Timelines

The major projects identified below will receive funding or will be active in the years indicated. This list is not all inclusive.



Funding (in thousands of dollars)

FY 1983	FY 1984	FY 1985*
7,837	5,171	5,584

* Estimated

Regional Program Contacts

Mr. Jim Sullivan
Chief, Environmental Studies Section
Minerals Management Service
Atlantic Regional Office
1951 Kidwell Drive
Vienna, Virginia 22180
Telephone: (703) 285-2165

GULF OF MEXICO OCS REGIONAL STUDIES PROGRAM

For leasing purposes, the Gulf of Mexico OCS Region is divided into the Western, Central and Eastern Gulf planning areas. The FY 1984 Regional Studies Plan, which provides detailed rationale and planning information for the regions's FY 1984 program, was based on the July 1982 Final 5-Year OCS Oil and Gas Leasing Schedule, with attendant changes in sale dates.

The area sales on the July schedule, with changes that took place through 1984, include:

Planning Area	Sale Number	Proposed Sale Dates
Western Gulf	84	July 1984
	102	August 1985
	105	July 1986
Central Gulf	81	April 1984
	98	May 1985
	104	April 1986
	110	April 1987
Eastern Gulf	79	January 1984
	94	November 1985

Program Rationale

Fifty-one oil and gas lease sales have been held in the Gulf of Mexico since 1953. In that time more than 27 million acres have been leased. Presently, the Gulf leasing activity (number of tracts leased) accounts for approximately 75% of all U.S. OCS leasing. Almost 22,000 wells have been drilled in Gulf OCS waters and approximately 6,800 are actively producing oil or gas today. There are almost 3100 platforms currently emplaced in the Gulf OCS waters and over 14,000 miles of pipeline in support of this production effort. Of the oil and gas produced from U.S. OCS areas, the Gulf of Mexico accounts for more than 94%.

Framed in the context of a lengthy history of oil and gas development activity, the Gulf of Mexico OCS Regional Studies Program emphasizes the assessment of long-term impacts. The principal goals of this program are summarized below:

1. Develop a management information base for marine and coastal areas of concerns.

2. Describe the effects of OCS activities on the biological environment, especially particularly productive features and habitats.

3. Produce information for development of mitigating measures.

4. Describe the physical and biological processes which are dominant in Gulf OCS areas which may play a role in an assessment of oil and gas development related impacts on the marine ecosystem.

The following overall objectives have been implemented as specific study areas through the Gulf of Mexico Regional Office.

1. Environmental Mapping--synthesize available geologic data to interpret the geologic framework and history of the Gulf of Mexico with the identification of potential geologic hazards particularly in the Mississippi River Delta Region; gather new data and synthesize geologic or ecologic information for preparation of environmental atlases or reports:

2. Pollutant Transport--collect meteorologic and physical oceanographic data throughout the Gulf to support a predictive modeling effort used in oil spill risk analyses and for air quality modeling.

3. Marine Ecosystems--synthesize literature and conduct field studies to characterize the northern Gulf of Mexico continental shelf, continental slope, and abyssal plain ecosystems, with emphasis in areas of OCS leasing.

4. Coastal Studies--develop an ecosystem model to delineate structure, function, and interaction of natural resource populations, habitats, and processes for Gulf of Mexico coastal margins; synthesize available economical and environmental information and develop land use and habitat maps. Develop an in-house geographic information system for analysis of coastal data.

5. Endangered Species--synthesize literature on distribution of marine mammals, turtles, and birds in the Gulf of Mexico and the potential impact of oil and gas activities; determine the effects of oil exposure and ingestion on turtles.

6. Cultural Resources Studies--synthesize available information to develop a predictive model on probabilities of occurrence of early man activity sites, and of locations of historic shipwrecks, and the probability of continued existence of such sites; and development of studies to test the predictive models.

7. Socioeconomic Studies--assemble socioeconomic information for the Gulf of Mexico coastal region to allow assessment of impacts of OCS activities on the coastal economies, or of impacts of specific events, such as major oil spills.

8. Ecological Effects Studies--determine short- and long-term effects of OCS activities within the Gulf of Mexico, with emphasis on long-term impacts near production platforms and coastal areas.

A detailed rationale for the Gulf of Mexico OCS Regional Studies Program can be found in the "Regional Studies Plan for the Gulf of Mexico", which is prepared annually.

Program Accomplishments

The Gulf of Mexico OCS Regional Studies Program is comprised of more than 20 active projects which are described in detail in the Catalog for Federal Ocean Pollution Programs. Following is a brief topical summary of accomplishments and findings during FY 1984.

- Environmental Mapping: Two projects were supported within this category during FY 1984: the first involved completion of an atlas of geologic and environmental information for nearshore areas of the Texas coast; and the second was the initiation of remote sensing and ground-truthing of seagrasses in the Northeastern Gulf to allow delineation of seagrass beds for development of protective measures.

- Pollutant Transport: Projects in this category have been developed to achieve an understanding of water circulation in the Gulf to support the MMS oil spill risk analysis model, to further understanding of the marine ecosystem of the Gulf, to provide a basis for understanding the functional processes to the Gulf ecosystem, and to support coordinating agencies interested in projecting impacts due to oil spills. Completed studies consist of efforts aimed primarily at synthesis of available hydrographic or circulation information, at development or testing of circulation models for the Gulf, and field data gathering from ships at sea, from instrumental drifting buoys, and from aircraft or satellites. The presently active and planned studies will expand the data and information base, and will support refinement of a recently developed, comprehensive circulation model with the goal of understanding Gulf current patterns and hydrology as well as a capability for diagnostic and prognostic circulation modeling. These are multi-year efforts, many of which are projected through 1986. A small project conducted by the U.S. Corps of Engineers, involving modification of a dredge-spoil disposal model for use as a mud-plume dispersal model, was completed with delivery of the preliminary final report and computer program for use on inhouse microcomputers.

- Marine Ecosystems: Three major projects have been active during FY 1984 within this study area. The Southwest Florida shelf ecosystem program continued studies of biological and physical processes in the study area, emphasizing use of towed and tripod-mounted cameras and other instrumentation to gather information on biological communities and environmental processes.

The Northern Gulf of Mexico Continental Slope study program has continued collection of field data and has reported on initial results from studies from the deep Gulf of Mexico. The overall purpose of the study is characterization of the seafloor and biologic communities of the deep Gulf, with special emphasis in areas of present or anticipated offshore oil and gas development.

The Mississippi-Alabama shelf program began in 1983, has concluded the initial phase of synthesis of available information and development of conceptual models to assist in field study planning. Field studies will be developed for initiation during FY 1986.

A long-running taxonomic study of polychaete annelids from BLM and MMS-funded studies in the Gulf of Mexico came to completion, with delivery and distribution of the 7-volume monograph entitled "Polychaetes of the Northern Gulf of Mexico."

o Coastal Studies: A group of long-term coastal studies has been managed by the National Coastal Ecosystems Team of the U.S. Fish and Wildlife Service, and comprises their coastal ecological characterization study program for the Gulf of Mexico. Under this multi-year program, a series of literature compilations, synthesis papers, fine-scale habitat and land-use maps, and ecosystem models have been developed for the coastal zone of the entire Gulf of Mexico. This program has been handled as a series of smaller projects, each defined by regional hydrologic regimes. Many deliverable products (maps, synthesis reports, etc.) are available in final form and others are available to decisionmakers in preliminary form. This program provides an environmental and socioeconomic information and planning base for the Gulf of Mexico coastal margin. Programs still active include the Texas Barrier Islands program, in the Western Gulf, and the Northeastern Gulf and Southwest Florida programs, in the Eastern Gulf. Information from all of these studies is now being used in the coastal ecological analysis program, initiated during FY 1984, to develop an in-house geographical information synthesis and perform analyses of the vulnerability of coastal land segments to oil spills.

o Endangered Species: A multi-year study, initiated during FY 1983 in cooperation with the MMS Atlantic Regional Office, resulted in preliminary study results during FY 1984 on the effects of petroleum on marine turtles; the study has continued funding from the Atlantic OCS Regional Office.

o Cultural Resource Studies: A study to ascertain the effectiveness of available survey techniques for identification of submerged early-man living sites was initiated during FY 1983, with study efforts being conducted during FY 1984 in an area of high site probability offshore Sabine Pass. (While planned through the Regional Studies Planning process the study received funds from outside of the National MMS Environmental Studies Program.)

- o Socioeconomic Studies: A major study to elucidate the direct impact of OCS oil and gas activities on the economies of the Gulf Coast was awarded, and preliminary study efforts were begun. Plans for a companion study, of indirect economic impacts of OCS oil and gas activities are now being developed.

- o Ecological Effects Studies: A major scoping effort was conducted for a study to be awarded during FY 1985 concerning the potential effects of OCS development on Gulf coast habitats, with major focus on impacts on wetlands of Louisiana and adjacent States.

- o Environmental Information Management: Two data management projects were conducted: one involved reformatting data from early BLM "baseline" studies into NODC-compatable formats; the other consisted of coding descriptive information regarding completed environmental studies into the NOAA/NEDRES information base. Additionally, the Fifth Annual Gulf of Mexico Information Transfer Meeting, was conducted. This major Gulf coast meeting provides a forum for exchange of information on regional research activities.

Program Timelines

The major projects identifed below will receive funding or will be active in the years indicated. This list is not all inclusive.

Major Program	.FY 1983	. FY 1984	. FY 1985	. FY 1986.
Pollutant Transport Studies				
Physical Oceanography Field Program	——	——	——	——
Circulation Modeling Program	——	——	——	——
Marine Ecosystems Studies				
Southwest Florida Shelf Program	——	——	——	
No. Gulf Continental Slope Program	——	——	——	——
Mississippi-Alabama Shelf Program		——	——	——
Coastal Studies				
Coastal Ecological Analyses	——	——	——	——
Socioeconomic Studies		——	——	——
Ecological Effects Studies				
Effects of OCS Activities on Coastal Habitats			——	——

Funding (in thousands of dollars)

FY 1983	FY 1984	FY 1985*
5,481	4,000	3,647

*Estimated

Regional Program Contact

Dr. Richard Defenbaugh
Chief, Environmental Studies Section
Minerals Management Service
Gulf of Mexico OCS Regional Office
Post Office Box 7944
Metairie, Louisiana 70010
Telephone: (504) 838-0896

PACIFIC OCS REGIONAL STUDIES PROGRAM

The Pacific Regional Office has jurisdiction for oil and gas leasing and development activities in the Southern California and Central and Northern California planning areas. The FY 1984 Regional Studies Plan, which provides detailed rationale and planning information for the region's FY 1984 program, was based on the July 1982 Final 5-Year OCS Oil and Gas Leasing Scheldule, with attendant changes in sale dates.

The area sales on the July schedule, with changes that took place through 1984, include:

Planning Area	Sale Number	Proposed Sale Date
Central California	73	November 1983
Central and Northern California	91	September 1985 (on hold)
Southern California	80	October 1984 (on hold)
	95	January 1986

Program Rationale

In California Federal waters, there are presently 16 platforms that have been installed and 9 others in various stages of planning in the Santa Barbara Channel and the San Pedro Bay. Eight sales have been held in the California OCS since 1966 resulting in over 298 exploration wells and 504 development wells. The Pacific OCS Regional Studies Program is set in the context of the need to establish monitoring efforts in light of current and planned oil and gas development activities in the southern and central California OCS areas. Post-sale activities play a major role in structuring the Environmental Studies Program in the Pacific. Opportunities of future development in relatively pristine environments and a rich and diverse marine mammal, seabird, and invertebrate fauna play important roles in the design of studies in the region.

The principal goals of this regional program include:

1. Predict potential impacts of air quality in the California coastal area resulting from existing and proposed OCS oil and gas leasing and development activities;
2. Determine the potential impacts to marine mammal and seabird populations from planned OCS activities;
3. Determine the short and long-term impacts of OCS oil and gas discharges on benthic communities through comprehensive monitoring;
4. Predict the impacts of oil and gas activities to coastal economies.

The following objectives have been implemented as specific projects by the Pacific Regional Office.

1. Pollutant Transport--collect field data to validate and/or modify air quality trajectory model; collect oceanographic field data to improve oil spill trajectory modeling in Santa Barbara Channel Region and Central California OCS Region.

2. Marine Ecosystems--investigate recovery processes in biological communities in California intertidal areas. Characterize benthic communities in the Santa Maria Basin and Western Santa Barbara Channel and detect and measure any changes which may be attributable to oil and gas production/development platforms.

3. Marine Mammals (and seabirds)--identify and map marine mammal and seabird population and abundance; define and quantify risks to selected species and populations; evaluate long-term effects of oil ingestion on seabird populations; investigate methods of mitigating effects of oil spills on the California Sea Otter.

4. Socioeconomic--identify and evaluate measures to minimize sea floor disturbances which cause multiple use conflicts; assess onshore socioeconomic impacts of OCS activities through collection and analysis of socioeconomic data bases for California counties.

A detailed rationale for the Pacific OCS Regional Studies Program can be found in the "California OCS Environmental Studies Plan", which is prepared annually.

Program Accomplishments

The Pacific OCS Regional Program is comprised of 23 active projects which are described in detail in the Catalog for Federal Ocean Pollution Programs. Following is a brief topical summary of some accomplishments and findings during FY 1984.

- Pollutant Transport: A major multi-year field program is in progress in the Santa Barbara Channel consisting of a series of hydrograhic cruises, surface drifter and long-term current meter deployment. A pilot program of 3 month current meter measurements and hydrographic cruises was completed and the longer term main experiment is in place. Results will be meshed with a numerical simulation. Additionally, an 18 month project has started in Central California coastal waters to describe surface circulation patterns and the three dimensional velocity and density structure. Both of the physical oceanography studies have shown small scale and mesoscale temporally variable currents and eddies. Velocities over 50 cm/sec have been observed in the Santa Barbara Channel and drifter studies in coastal California have shown complex surface current patterns with reversals and eddy structures. A study is almost completed to better define the physical and biological processes which influence the long-term transport and fate of drilling muds in the California OCS. This study, which employed discharge simulations using the OOC computer model, demonstrated that depths and current velocities play dominant roles in determining the amount of drilling mud which accumulates on the ocean floor.

o Marine Ecosystems: In preparation for future benthic monitoring studies a major field effort and historical data analysis effort was initiated in 1983 for the Santa Barbara Channel and Santa Maria Basin areas. Results of this reconnaissance will be used to guide the design of monitoring efforts and the selection of appropriate "experimental" and "control" locations. The analysis of historical data from marine areas in Southern California similar to those areas to be monitored, pointed out the high level of effort (frequently more than 100 replicate samples) needed to detect changes in single species of benthic animals. This analysis is being used by municipal sewage destricts in Southern California for designing their monitoring programs as well as by EPA Region IX and other federal and state agencies. Reconnaissance cruises in soft bottom and hard rock outcrop areas have been completed and preliminary examination of the data indicates a relatively homogeneous environment with little change in community structure with latitude.

Field work was undertaken this year on a 5-year program begun in FY 1983 to describe the long-term variation of intertidal community structure and to determine the response of rocky intertidal communities to natural and man-induced perturbations. This project takes advantage of a recently completed project which provided descriptive information of the California coastal intertidal zone north of Point Conception.

A study was started in FY 1984, "Adaptation of Marine Organisms to Chronic Hydrocarbon Exposure", which will examine the reproductive capacities or adaptations of organisms to oil from oil seeps located in the Santa Barbara Channel. Results of previous work around these seeps have shown the benthic organisms to be in greater abundance at seep stations compared to other areas at the same depth; evidence seems to indicate the marine food chain is using the oil as a source of energy and carbon.

- Endangered Species: Following 3 years of aerial surveys of marine mammals and seabirds in the California OCS coastal and offshore area reports were prepared in 1983 which include maps and overlays depicting important marine mammal and seabird congregation, breeding, feeding and migration areas. A multi-year study of long-term sublethal effects of ingested oil on a population of Cassin's Auklets in the Farallon Islands was extended because of the significant impact EL Nino had on "normal" breeding activities. A similar additional effort was begun using a Wedge-Tailed Shearwater population on Manana Island, Hawaii. Work progressed in an effort to use simulation modeling to define the risks from oil and gas development activities to populations of marine mammals and seabirds. Preliminary results from these two field efforts indicate that oiled birds had a high rate of nest abandonment and lowered hatching success.

  A 3-year field and data/literature analysis effort was initiated in 1983 to develop predictions of how the California sea otter population size and productivity would be affected by oil spills. Components of this effort also included computer simulations incorporating populations dynamics and movement patterns. In FY 1984 the tagging of twenty-five Alaskan sea otters was completed. Movement pattterns of these otters were monitored in the fall and winter. In addition, a sea otter oil spill mitigation study was initiated in FY 1984. This study is designed to analyze the effectiveness of existing sea otter capturing, cleaning, and rehabilitation methods and to develop new methods to reduce the impact of accidental oil spills to sea otters.

- Socioeconomics: Two socioeconomic studies were started in FY 1984 and two were completed. The two new studies are "Development of Baseline Data for Socioeconomic Characterization and Modeling in California as Related to Offshore Oil and Gas Activities" and "Impacts of OCS Development on Recreation and Tourism". The first will focus on a socioeconomic profile of San Luis Obispo County where oil and gas activities are increasing and a Factbook patterned after the New England River Basins Commission (1979) report will be written. The two studies completed this past year were "Cumulative Socioeconomic Impacts of Oil and Gas Development in the Santa Barbara Channel Region: A Case Study" and "Mitigation of Sea Floor Conflicts Between Oil and Gas Pipelines and Commercial Trawl Fisheries". The first study demonstrated the small degree of change in Santa Barbara County directly attributed to OCS oil and gas activity, and the second study discussed anchoring techniques and operational procedures for placing structures on the ocean floor which will result in minimum bottom disturbances.

Program Timelines

The major projects identified below will receive funding or will be active in the years indicated. This list is not all inclusive.

Major Programs	FY 1983	FY 1984	FY 1985	FY 1986
Pollutant Transport				
Santa Barbara Channel Circulation	———	———	———	———
California Shelf Circulation	———	———	———	———
Long-term Transport	———	———	——	
Marine Ecosystems				
Benthic Biological Characterizations	———	———	——	
Rocky Intertidal Community Studies	———	———	———	———
Monitoring Program	———	———	———	———
Adaptation of Organisms to Hydrocarbons		——	———	———
Endangered Species				
Seabird Oil Toxicity	———	———	———	
California Sea Otter Studies	———	———	———	———
Marine Mammal and Seabird Surveys	———	———	———	———
Marine Mammal and Seabird Risk Analysis	———	———	——	

Funding (in thousands of dollars)

FY 1983	FY 1984	FY 1985*
5,199	5,089	3,635

* Estimated

Regional Program Contact

Dr. Fred Piltz
Chief, Environmental Studies Section
Minerals Management Service
1340 W. 6th Street
Los Angeles, California 90017
Telephone: (213) 688-7120

ALASKA OCS REGIONAL STUDIES PROGRAM

The Alaska Regional Office is responsible for administering lease sales for all OCS areas in Alaska. For leasing purposes, Alaska is divided into the regions and areas indicated below. The FY 1984 Regional Studies Plan, which provides detailed rationale and planning information for the region's FY 1984 program, was based on the July 1982 Final 5-year OCS Oil and Gas Leasing Schedule, with attendant changes in Sale dates.

The area sales on the July Schedule, with changes that took place through 1984 include:

Arctic Region

Planning Area	Sale Number	Proposed Sale Date
Diapir Field	87 97	August 1984 December 1986
Barrow Arch	85 109	February 1985 (cancelled 3/84) February 1987

Bering Sea and Gulf of Alaska Regions

Planning Area	Sale Number	Proposed Sale Date
Navarin Basin	83 107	April 1984 March 1986
Gulf of Alaska/Cook Inlet	88	December 1984
St. George Basin	89 101	September 1984 April 1986
N. Aleutian Basin	92	December 1985 (on hold)
Norton Basin	100	December 1985
Kodiak	99	October 1986
Shumagin	86	June 1987

Program Rationale

Since 1976, there have been 12 oil and gas lease sales in the Alaska OCS Region. Early leasing and exploration activity occurred in the Gulf of Alaska. Recently, exploration activity has increased in the Beaufort and Bering Seas. To date, no commercial finds have been reported.

As the managing Agency for the OCS leasing program in Alaska, the MMS Alaska OCS Region has initiated environmental and socioeconomic studies to ensure that potentially adverse effects on the environment are considered in management decisions.

Framed in the context of analysis and study of interrelated ecosystem components, the MMS Alaska OCS Regional Studies Program is dedicated to providing information essential for long and short-term oil and gas leasing decisions. In anticipation of shifts in information needs relative to development stage decisions, the program is planning studies to meet post-lease and monitoring information requirements. Detailed rationale for the Alaska OCS Region's program can be found in the "Alaska Regional Studies Plan, which is prepared annually".

A portion of the Alaska Environmental Studies Program is contracted for MMS through an interagency agreement with the National Oceanic and Atmospheric Administration (NOAA), U.S. Department of Commerce. The NOAA manages this program component through the Outer Continental Shelf Environmental Assessment Program (OCSEAP) office in Anchorage, Alaska. Other environmental and all socioeconomic studies are administered and contracted directly from the MMS Alaska OCS Regional Office in Anchorage.

The principal goals of the Alaska OCS Regional Studies Program are to:

1. Elucidate physical processes that influence transport of spilled oil and other oil and gas related pollutants.
2. Characterize regional biota, habitats and ecosystems and analyze ecosystem functioning to develop an analysis of the effects of oil and gas development activities.
3. Describe geologic and ice hazards that may affect activities associated with oil and gas development.
4. Determine and assess potential onshore social and economic effects from oil and gas development activities.

Program Accomplishments

The Alaskan Program is comprised of more than 71 active projects which are described in detail in the Catalog for Federal Ocean Pollution Programs. Following is a brief topical summary of accomplishments and findings during FY 1984.

- Endangered Species: The Endangered Species Act of 1973 prohibits major Federal actions that jeopardize listed species. In addition, the Marine Mammal Protection Act of 1972 established a national policy to protect marine mammal populations and to encourage their development to the greatest extent feasible. The bowhead whale, an endangered marine mammal that is of key importance to Native culture, makes extensive annual migrations through six OCS planning areas.

In 1984, the Naval Ocean System Center (NOSC) continued aerial surveys to determine bowhead distribution and relative abundance in the Beaufort, Bering and Chukchi Seas. Another group conducted bowhead behavioral studies in the eastern Beaufort Sea. Both study teams were successful in conducting difficult, controlled experiments involving bowhead whales and full-scale geophysical seismic arrays. These experiments provided much-needed information on bowhead response to sound resulting from marine geophysical oil exploration. The aerial survey study also had the added function of monitoring the position of the westward bowhead migration in relation to drill sites and general areas of marine geophysical exploration. Daily flight tracks and bowhead sightings were transmitted to MMS, National Marine Fisheries Service (NMFS), and then to State of Alaska regulatory officials. Flight tracks and bowhead sightings from seismic companies were coordinated daily with the principal NOSC monitoring contractor via radio telephone.

A final report on 2 years of endangered whale surveys in the Navarin Basin, a bowhead whale overwintering area, was completed. Another final report, completed in 1984, indicated that it was feasible to create a bowhead whale migration model and link it to an oil spill trajectory model. Based on this recommendation, a contract was awarded to create and link the two models and to determine the probability of bowhead whales interacting with potential oil spills.

Late in FY 1984, in an effort to anticipate bowhead monitoring needs in the Navarin Lease Sale area of the northwestern Bering Sea, a study was initiated to assess the feasibility of whale/ice monitoring by remote sensing. Past research has indicated that bowheads wintering in Navarin Basin may have an affinity for sea ice of particular thickness and concentration. The final report on this study is due in December 1985.

In FY 1984, surveys of the Chukchi and Beaufort Seas were made which determined the distribution and relative density of all endangered marine mammals in those areas. In FY 1984, studies of the effects on whales of noise from oil and gas exploration and development continued for both migrating gray whales and feeding humpback whales.

Other studies on endangered marine mammals that continued in FY 1984 involved attachment of satellite tags onto gray whales; studying the feeding ecology of gray whales; analyzing gray whale tissue; and modeling the probability of gray whales encountering an oil spill. Also, a new project was initiated to prepare a bibliographic classification of OCS-related literature on gray and right whales.

- o Living Resources: Nonendangered marine mammal studies in Alaska during FY 1984 concentrated on the ringed seal and northern fur seal. An on-ice field study continued on ringed seal life history and acoustics, and aerial-based monitoring of ringed seals was also funded. A study was begun to model the effect of oil spills on the population dynamics of northern fur seals.

Population counts have been completed at all major seabird colonies in the Bering Sea; the work has been done primarily by the U.S. Fish and Wildlife Service with funds contributed by the MMS. During FY 1984, MMS carried out the following monitoring-related activities: censused the seabird colonies on the Pribilof Islands and on Cape Pierce in Bristol Bay; recensused the waterfowl in the Prudhoe Bay area; and conducted a small conference to determine the best methods of future monitoring of the many seabird species at multiple colonies in Alaskan OCS areas.

Studies of fish and shellfish during FY 1984 focused on the southeast Bering Sea. Surveys in the nearshore waters adjacent to the North Aleutian Shelf area of the seasonal migration and feeding habits of juvenile salmonids were initiated. An ecosystem study in the area surveyed the dominant forage fish and anadromous fish in the same area. Considerable refine-ment of a fisheries food web model for king crab, sockeye salmon, and yellowfin sole populations in Bristol Bay has been undertaken in support of the oil-effects studies discribed below. Two studies in this area were completed in 1984: the first was a study on the feeding ecology and energetic requirements of juvenile king and tanner crabs, and the second was a study of the distribution of larval and juvenile red king crab.

Three other fish studies were ongoing outside of the southeast Bering Sea in 1984. A study of crabs in the nearshore waters of the Pribilof Islands was completed. This study delineated the seasonal distribution and abundance of juvenile and adult king and Korean hair crabs. In the Yukon River delta, a study was initiated on the distribution, seasonal abundance, and foods of juvenile salmon. In the northeastern Chukchi Sea, as part of the Peard Bay ecosystem study, surveys were conducted of the abundance and diet of dominant coastal fish, which include arctic cod and saffron cod. Also, two fishery review papers were in preparation for the planned book on OCS-related research in the Gulf of Alaska. The papers dealt with past fish and shellfish studies, and environmental information relevant to fisheries oceanography.

o Ecosystem Studies: The general purpose of ecosystem studies is to learn about the biological and physical processes that support important species. During FY 1984, ecosystem studies were continued in three areas: (1) Peard Bay on the northeastern edge of the Chukchi Sea, (2) the Yukon River Delta, and (3) Izembek Lagoon and the North Aleutian Shelf Lease area along the Alaska Peninsula. The Yukon River Delta and North Aleutian Shelf Ecosystem Studies were closely coordinated with other studies of juvenile salmon, a species which is very important because of commercial and subsistence fisheries. All three of the ongoing ecosystem studies focus on areas of special biological sensitivity to possibile oil spills.

o Fates and Effects: A vital portion of the studies program is centered on the potential effects that oil spills may have on marine organisms and habitats. During FY 1984, computer simulation modeling was used to predict the effects of oil spills on fur seal population dynamics. Additionally, lethal and sublethal effects of oil on euphausiids were studied because of the importance of the species as food for bowhead whales.

Several studies addressed the effects of oil on commercially important fishes. One study was completed on the reproductive success in tanner and dungeness crabs during long-term exposures to oil-contaminated sediments. The crabs were monitored for egg production, fertilization, extrusion, attachment, development, hatching, and larval viability, as well as for hydrocarbon concentrations in eggs, larvae, and adults. Another study that continued in 1984 was the NMFS Northwest and Alaska Fisheries Center's simulation modeling of the effects of acute oil spills on commercially important fishery resources in the Bering Sea. For this project, numerical models were prepared describing the sedimentation of spilled oil, the effects of oil on feeding and migration, and on eggs and larvae of candidate species. Results from this project will include quantitative estimates of mortalities to eggs, larvae, juveniles, and adults. A new project, initiated in 1984, is studying the lethal and sublethal effects of oil on herring reproduction. This project will determine the sensitivity of larvae exposed to crude oil, and the survival and growth of feeding larvae exposed to oil or oil-contaminated food.

In FY 1983, the MMS Alaska OCS Region initiated a program for monitoring long-term effects of oil and gas discharges in the Beaufort Sea. Through Interagency Agreement with NOAA/OCSEAP, the Alaska OCS Region studies staff participated in planning and conducting the "Beaufort Sea Monitoring Workshop." Results of this workshop were used to develop the field monitoring study which was initiated in FY 1984. The objective the 3-year project, "Beaufort Sea Monitoring Program: Analysis of Trace Metals and Hydrocarbons from OCS Activities", is to detect and quantify possible accumulation of discharged hydrocarbons and heavy metals in benthic sediments and organisms.

Knowledge about hydrocarbon contamination in arctic and subarctic environments has come from several site-specific studies. These have shown that there are long resident times and extended recovery periods for affected biological and physical components and processes. In FY 1984, a predictive model was completed that describes the physical and chemical changes in oil spilled in the presence of sea ice. This model was integrated with an existing open water oil weathering model. Two other studies were underway which will also be integrated with the oil weathering and circulation models. These focus on suspended particulate matter and the surf zone.

o Pollutant Transport: Potential oil spills and the transport of oil have been a major focus of the environmental assessments for Alaska OCS lease sales. To evaluate the probable behavior of potential spills, a computer simulation model was developed through the studies program. During FY 1984, circulation and trajectory modeling was conducted for the North Aleutian Shelf (Sale 92), Norton Basin (Sale 100), St. George Basin (Sale 89), and the Diapir Field (Sale 97) sale areas. The model was further calibrated using bottom pressure measurements from Norton Sound and the Chukchi and Beaufort Seas. Modeling results were also used in conjunction with a fisheries/oil interaction modeling study and with oil spill fate models.

- Hazards: Hazards are severe processes that may adversely affect exploration and development structures. The hazards that are studied are regional in nature and require long periods to quantify and predict. Active surface and near-surface faulting are examples. In recent years, studies that focused on sea ice mechanics and forces were funded at a moderate level through the MMS-funded Technology Assessment and Research Program (TARP). (The budget for the TARP is not included in this report). Other studies focus on possible constraints imposed by meteorological conditions, such as structural and spray icing, sea ice movement, storm surge, and extreme winds and waves. Description and quantification of regional sea ice characteristics and of geologic processes on the Arctic shelf, with an emphasis on ice gouging, also continued to receive program support in FY 1984.

- Social and Economic Studies Program: This program was begun in 1976 with the recognition by the Department of Interior that the societies of rural Alaska were especially vulnerable to the influences of western industrial development. At the outset, the Social and Economic Studies Program (SESP) was structured around several core study areas and, while this structure has been loosely maintained, the program has become more focused in its analysis of the effect of offshore development on various social systems. The original core study areas were selected based on a general approach where the social trends of the State or a region or community within the State were analyzed; first, in the absence of a lease sale and, then, assuming that the lease sale occurs. These core areas are:

1. Petroleum Technology Assessments: to identify the petroleum technologies and the development scenarios that may be used in the lease sale area to develop oil and gas resources.

2. Economic and Demographic Systems Analyses: to forecast the effects of offshore development on the employment and population of onshore communities and the state.

3. Commercial Fishing Industry Studies: to forecast the effects of offshore oil development activities upon Alaska's commercial fishing industry--specifically, competition for port facilities, gear loss, competition for labor, and damage functions.

4. Transportation Effects Studies: to forecast the effects of offshore development on the capacity of existing and future transportation systems.

5. Regional Socioeconomic and Sociocultural Studies: to analyze the history, social organization, population, demographic characteristics, land use, and government of regions in the state which are likely to host onshore support facilities.

6. Sociocultural Systems Studies: to forecast the effects of the development of a lease sale on local sociocultural systems including local community ties, settlement patterns, subsistence patterns and values, social and political systems, and response to change.

The earlier studies in the program relied primarily on the collection of secondary information for the development of baselines. Since FY 1982, the trend has shifted towards studies involving substantial fieldwork. As our understanding of these systems has grown and as our predictions of the potential effects caused by development have become more detailed, the SESP has responded by conducting studies on fairly specific problem areas.

These specialized studies are designed to develop more understanding about the dynamic relationships between the local and regional society and potential development offshore, and to fill information gaps. These studies are:

1. Monitoring of Petroleum Activities - FY 1980 Lower Cook Inlet
   FY 1983 Beaufort Sea
   FY 1984 Bering Sea

2. Social Indicators for Impact Monitoring - FY 1981
   FY 1984 Aleutian Islands

3. Effects of Harvest Disruption of Subsistence Resources - FY 1981
   FY 1984
   Alaska Peninsula

4. Evaluation of Bering Sea Crude Oil Transportation Systems - FY 1984

5. Unimak Pass Vessel Analysis - FY 1984

6. Sociocultural Monitoring - FY 1984 Beaufort Sea

- Environmental Information Management: The Alaska Environmental Studies Program for FY 1984 included 71 studies in 9 subject areas covering the 3 Alaska leasing regions. The size and scope of this program necessitates mechanisms to integrate study results. Several projects digitize their physical and biological field data into standardized formats for submission to a national archive. These data are quality controlled by a data-processing contractor for accuracy and consistency. Once stored, data from multiple projects can be merged for retrieval by subject and/or area. Computer-generated tables and maps are then produced for use in an environmental assessment of the total planning area.

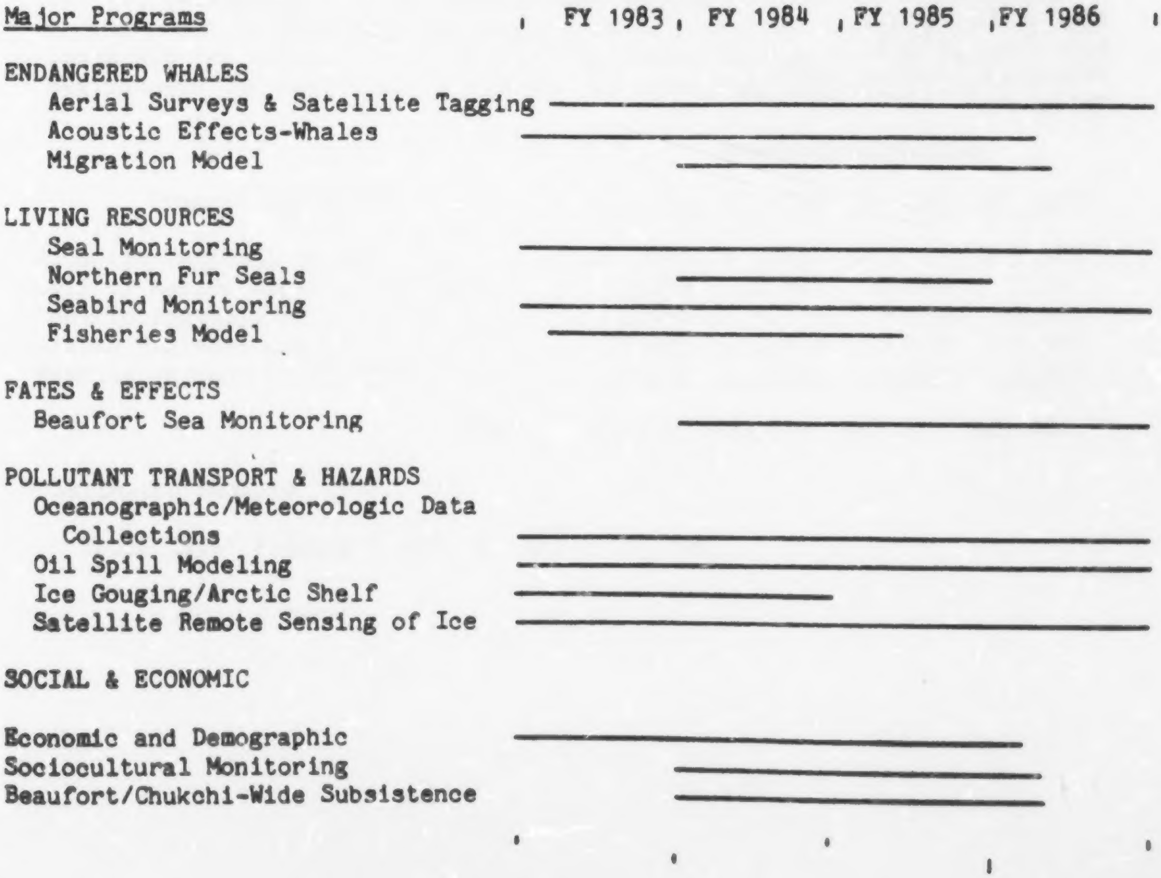
  Synthesis meetings are scheduled for each planning area to allow integration of multidisciplinary data from social and natural sciences. They also provide an opportunity for in-depth analysis of potential environmental issues related to proposed leasing. The results of these efforts are published. In FY 1984, synthesis meetings were conducted for the Barrow Arch (Sale 85) and the Norton Basin (Sale 100) areas.

Additionally, during the 1984 fiscal year, small conferences were organized on the following topics: (1) Monitoring of Seabird Populations in the Alaskan Outer Continental Shelf Region; and (2) Outer Continental Shelf Economic and Demographic Impact Modeling for Rural Alaska.

The NOAA/OCSEAP maintains an on-line bibliography of project publications. In FY 1984 the program also published a Comprehensive Bibliography from this data base. The MMS endangered species reports were added to this data base in late 1984 so that all Alaska environmental study reports could be accessed through this system. The MMS has also funded the preparation of several books to help transfer information from reports with limited circulation to generally available publications. Books in progress in FY 1984 included "The Alaskan Beaufort Sea: Ecosystems and Environment" and "The Gulf of Alaska: Physical Environment and Biological Resources."

Program Timelines

The major projects identified below will receive funding or will be active in the years indicated. This list is not all inclusive.



FUNDING (in thousands of dollars)

	FY 1983	FY 1984	FY 1985*
Alaska Environmental Studies	$11,847	$11,606	$ 9,309
Alaska Socioeconomic Studies	1,299	1,489	1,275
TOTAL	$13,146	$13,095	$10,584

*Estimated

REGIONAL PROGRAM CONTACTS:

Dr. Cleveland Cowles
Chief, Environmental Studies Unit
Minerals Management Service
Alaska OCS Region
P.O. Box 101159
Anchorage, Alaska 99510
Telephone: (907) 261-4617

Chief, Social and Economic Studies Unit
Minerals Management Service
Alaska OCS Region
P.O. Box 101159
Anchorage, Alaska 99510
Telephone: (907) 261-4648

SECTION III

PROGRAM AND FUNDING TRENDS

The environmental studies program was initiated in 1973 with a series of information synthesis on the environmental and economic characteristics of various OCS leasing areas. The program grew rapidly with emphasis on benchmark studies designed to describe the physical, chemical, geological and biological components of OCS lease areas in a manner which would permit sound statistical comparison to post-development conditions. In 1977-78 the program began to shift its emphasis away from benchmark studies. Based on recommendations received from the National Research Council, an emphasis was placed on relating research efforts more directly to the specific resource-management decisions associated with the OCS Leasing Program.

Since 1981 a growing emphasis in the Program has been toward a better understanding of oceanographic processes that influence the long-term cummulative impacts of OCS oil and gas development activities. Since 1982 increased emphasis has also been given to information management. As oil and gas development activities increase in the various OCS regions, monitoring programs are being implemented to meet the requirements of the OCS Lands Act (as amended). Table III-1 indicates funding trends amongst the Regions and the Washington Office for the period FY 1982-FY 1985.

	Budget Allocations			
Program Office	FY 1982	FY 1983	FY 1984	FY 1985*
Atlantic Regional Studies	$ 7,878	$ 7,837	$ 5,171	$ 5,584
Gulf of Mexico Regional Studies	3,879	5,481	4,000	3,647
Pacific Regional Studies	3,645	5,199	5,089	3,635
Alaska Regional Studies	14,223	13,146	13,095	10,584
Washington/Generic Studies	1,235	1,856	1,304	2,630
TOTAL	$30,860	$33,519	$28,659	$26,080

* Estimated Budgets for FY 1985

Table III-1 Funding Trends FY 1982 - FY 1985

SECTION IV

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SECTION V

APPENDIX

Major Minerals Management Service Environmental Studies Projects Started in Fiscal Year 1984

Coastal and Surf Zone Smear Model

Monitoring of Nesting Seabird Colonies - Pribilof Islands and Cape Peirce

Simulation Modeling of Effects of Oil Spills on Furseals

Integration of Suspended Particulate Matter Distribution and Oil Transport Studies

Beaufort Sea Petroleum Technology Assessment

Beaufort Sea Monitoring: Analysis of Hydrocarbons and Trace Metals in Sediments and Biota

Seasonal Habitat Use by Inshore Species of Fish North of the Alaska Peninsula

Yukon Delta Processes - Field Work

Effects of Oil on Herring Reproduction

Effects of Oil on Food Organisms of Bowhead Whales

Florida Atlantic Coast Transport Study

Analysis of Physical Oceanography Data Offshore North Carolina

North Atlantic Slope and Canyon Physical Processs Study

Analysis of Trace Metals in Bottom Sediments in Support of Deepwater Biological Processes Studies on the U.S. Atlantic Continental Slope and Rise

Florida Big Bend Sea Grass Habitat Study

Gulf of Mexico Meteorological Data Base Compilation and Analysis

Gulf of Mexico Coastal Ecological Analyses

Sea Otter Oil Spill Mitigation Study

Analysis of Indicators for Socioeconomic Impacts Due to OCS Oil & Gas Activities in the Gulf of Mexico

Adaptation of Marine Organisms to Chronic Hydrocarbon Exposure

Central and Northern California Seabird Ecology Study

Pilot Study to Determine Feasibility of Using Lignosulfonates a Tracers of Drilling Muds in Marine Sediments

Air Quality Modeling Study of Proposed Northen, Central and Southern California Lease Offerings

Development of Baseline Data for Socioeconomic Modeling in North Santa Barbara Country and San Luis Obispo Country

Impacts of Development on Recreation and Tourism in California

APPENDIX G

Memorandum of Understanding Between the Environmental Protection Agency and the Department of the Interior Concerning the Coordination of National Pollutant Discharge Elimination Systems Permit Issuance with the Outer Continental Shelf Oil and Gas Lease Program

ATTACHMENT 1

MEMORANDUM OF UNDERSTANDING
BETWEEN THE
ENVIRONMENTAL PROTECTION AGENCY
AND THE
DEPARTMENT OF THE INTERIOR
CONCERNING THE COORDINATION OF NPDES PERMIT ISSUANCE WITH THE OUTER CONTINENTAL SHELF OIL AND GAS LEASE PROGRAM

I. PURPOSE

The purpose of this Memorandum of Understanding (MOU) is to improve cooperation and coordination between the Environmental Protection Agency (EPA) and the Department of the Interior (DOI) in oil and gas lease activities on the Outer Continental Shelf (OCS) to determine the terms and conditions of National Pollutant Discharge Elimination System (NPDES) permits and ensure NPDES permit compliance. This MOU establishes that each Agency will coordinate studies and related regulatory responsibilities and cooperate to ensure that EPA can issue NPDES permits at the time of the Final Notice of Offering by DOI. To the extent possible, this MOU will also combine related National Environmental Policy Act requirements.

II. DEFINITIONS

For the purposes of this MOU the following definitions apply:

Outer Continental Shelf (OCS) All submerged lands lying seaward and outside of the area of lands beneath navigable waters as defined in section 2 of the Submerged Lands Act of 1953, 43 U.S.C. 1301, and of which the subsoil and seabed appertain to the United States and are subject to its jurisdiction and control.

OCS Oil and Gas Activity Any offshore activity on the OCS pursuant to a Federal lease or permit resulting in effluent discharges associated with the exploration, development, or production of oil and gas mineral resources.

OCS Facility Any artificial island, installation, or other device permanently or temporarily attached to the seabed or subsoil of the OCS and used for oil and gas activity. This term includes fix[illegible]ting structures and mobile offshore drilling units attached [illegible]ed, including self-positioning drill ships, but does not include a [illegible]er port or vessel engaged in transportation.

Individual NPDES Permit Individual NPDES permits regulate the discharge of pollutants from point sources under section 402(a) of the Clean Water Act (CWA). These permits identify a named party through an application requirement.

General NPDES Permit General NPDES permits regulate a category of point sources located within the same geographic area whose discharges warrant similar pollution control measures. General permits do not require applications from named parties.

Area of Biological Concern

For the purpose of issuing NPDES permits, an area of biological concern is a portion of the OCS identified by EPA, in consultation with DOI, as containing potentially productive or unique biological communities or as being potentially sensitive to discharges associated with oil and gas activities.

III. STATUTORY AUTHORITIES

The Outer Continental Shelf Lands Act (OCSLA)

The OCSLA establishes a policy for the management of mineral resources on the OCS and provides for the protection of the human, marine and coastal environments. Under the OCSLA, DOI has authority to conduct OCS lease offerings, including preparation for leasing, and for the regulation and management of post-lease activities on the OCS. Within DOI, the Minerals Management Service (MMS) is responsible for preparing for and conducting OCS lease offerings and for regulating and managing post-lease activities.

The Clean Water Act (CWA)

Under the CWA and its amendments, EPA has authority to issue NPDES permits for the discharge of pollutants from point sources into waters of the United States, including the territorial seas, contiguous zone, and oceans. NPDES permits for OCS oil and gas facilities may contain effluent limitations developed pursuant to a number of sections of the Act including 301, 302, 306, 307, and 403. Section 403 requires that an NPDES permit for a marine discharge be issued in compliance with EPA's guidelines for determining the degradation of marine waters. Final Ocean Discharge Criteria guidelines were promulgated at 45 FR 65942 (October 3, 1980)(40 CFR Part 125).

The National Environmental Policy Act (NEPA)

The NEPA, as amended, establishes a national policy for the protection of the environment. Section 102(2)(c) establishes that all Federal agencies shall prepare Environmental Impact Statements (EISs) to examine proposed major Federal actions which significantly affect the quality of the human environment. DOI may need to prepare EISs before issuing oil and gas leases. When new source performance standards are promulgated for the offshore subcategory under the CWA, EPA may have NEPA responsibilities for permits issued to new sources (section 306 of the CWA) which overlap with those of DOI.

IV. PROVISIONS FOR COORDINATION OF NPDES PERMIT ISSUANCE WITH OCS LEASE OFFERINGS

This MOU establishes the following provisions regarding the types and timing of NPDES permit issuance with regard to OCS lease offerings and the necessary development and exchange of information between the two agencies. Both agencies recognize that the types and timing of NPDES permits are dependent upon the development and exchange of information sufficient to address the CWA section 403(c) Ocean Discharge Criteria. Each agency (EPA and MMS) will assume the responsibility for communicating this information to its field offices and for enforcing its provisions to assure that this MOU will be implemented with national consistency.

A. Types of NPDES Permits

1. EPA will, wherever possible, issue general NPDES permits for OCS oil and gas activities. These general NPDES permits may be for entire tracts, groups of tracts, or whole OCS planning areas in OCS lease offerings. A general permit

may contain effluent limitations and operating conditions which vary within the areas covered by the permit. These permits shall be effective for a fixed term not to exceed five (5) years.

2. EPA will, wherever possible, subject areas of biological concern to general NPDES permits. These general permits may impose different or additional requirements than those imposed in permits for surrounding or adjacent areas.

3. The geographic areas to be covered by NPDES permits shall be identified in reference to OCS Protraction Diagrams and the lease blocks indicated on such diagrams, or in terms of planning areas identified in the 5-Year OCS Oil and Gas Leasing Program approved by the Secretary of the Interior.

4. The Regional Administrator shall issue general permits for discharges from oil and gas facilities within the Region's jurisdiction unless the Regional Administrator determines that the use of a general permit is inappropriate and individual permits are required.

B. Timing of NPDES Permits

1. When an EPA Regional Administrator determines that a general permit is appropriate, he shall issue a project decision schedule which provides for the issuance of a final general permit no later than the Final Notice of Offering for the lease offering as projected by DOI. In cases where petitions for judicial review are filed during the lease sale process potentially affecting permit terms and conditions, the permit process may be stayed and permit terms and conditions reevaluated following final judicial decision.

2. Where there is sufficient information to address the 403(c) Ocean Discharge Criteria, draft general NPDES permits will, except in unusual circumstances which are communicated to EPA Headquarters, be available for public comment at the time of issuance of draft EISs for OCS lease offerings. The timing of public hearings for draft NPDES permits will be coordinated with public hearings for draft EISs.

C. Development and Exchange of Information

To implement the types and timing of NPDES permits described above, and to foster cost effective development of the information needed to determine appropriate permit limitations and conditions, both agencies agree to the following:

1. EPA will participate in the MMS Environmental Studies Program through its representatives on the Regional Technical Working Groups (RTWGs) and through coordination with the MMS Branch of Environmental Studies in Washington, D.C. EPA will participate fully at the regional and national levels to ensure that the information required by EPA is included in the process leading to the planning (annual and five year), selection, and ranking of studies for funding consideration by MMS. MMS will assure that information requirements provided by EPA shall be given thorough consideration by the RTWG's and by the Scientific Committee of the OCS Advisory Board and given timely and thorough consideration in the assessment of national research needs for the final determination of studies funding by MMS. EPA Headquarters shall provide comments on each year's National Study Plan to the Chief, Branch of Environmental Studies, before the final approval of that plan by

best copy available

the Associate Director for Offshore Minerals Management. MMS's funding and resource commitments for EPA's information requirements shall be carried out within the MMS established procedures.

2. EPA may identify information requirements for establishing the terms and conditions of NPDES permits throughout the leasing program. In order to be most effective, these information requirements should be identified during the development of the five year leasing schedule but in all cases prior to the issuance of the Call for Information for a particular part of the lease offering. EPA Regional Administrators will provide information requirements to the appropriate MMS Regional Managers through the RTWGs and to the Chief of the Branch of Environmental Studies (MMS) through the Director of the Office of Water Enforcement and Permits (EPA). Information needs requiring long-term and/or generic studies will be presented jointly by MMS and EPA to the Scientific Committee of the OCS Advisory Board. EPA and MMS will, to the extent possible, take advantage of each agency's EIS preparation activities related to OCS information needs. These activities include but are not limited to pre-EIS liaison and scoping at regional and national levels.

3. EPA and DOI will coordinate the identification and results of studies including monitoring programs related to discharges and impacts associated with oil and gas activities to avoid duplication of effort. This coordination will use existing groups and processes to the maximum extent feasible.

4. EPA, in consultation with MMS, will develop criteria to assess the vulnerability of OCS lease areas to the discharges associated with oil and gas activities. During the development of these criteria, EPA will submit working drafts to MMS and other appropriate agencies for review and comment. These criteria may be used by EPA and MMS through the RTWG Committees and the Scientific Committee of the OCS Advisory Board to suggest appropriate NPDES permit conditions, and to assess information needs and studies related to the determination of appropriate NPDES permit conditions.

V. COORDINATION OF NEPA RESPONSIBILITIES

When new source performance standards are promulgated for the Offshore Subcategory of the Oil and Gas Point Source Category under section 306 of the CWA, EPA may have EIS requirements under NEPA for the issuance of NPDES permits for oil and gas exploration, development, and production activities. It is intended that these NEPA requirements will be coordinated with the existing MMS NEPA process, to the extent such coordination does not jeopardize or delay individual lease offerings or NPDES permits.

The major focus of cooperation will be to use, and supplement where possible, information from the MMS environmental studies program so that the maximum number of permit decisions can be made by the time of the Final Notice of Offering. In accordance with CEQ procedures, successful completion of the adoption process of the lease sale EIS will fulfill EPA's NEPA responsibilities related to those permit decisions completed at the time of the lease sale. If there are significant issues that cannot be resolved prior to issuance of the final statement, both MMS's and EPA's views shall be accurately set forth in the final statement. For those permits issued after the Final Notice of Offering, the associated NEPA requirements will, to the extent possible, be fulfilled through the use of the lease sale EIS with appropriate modifications or supplements.

VI. POST LEASE MONITORING, INSPECTION, AND ENFORCEMENT

Since the MMS has in place effective resources to carry out inspections of OCS facilities, this MOU establishes that:

A. MMS will establish, to the maximum extent possible, requirements for drilling procedures and equipment consistent with EPA's NPDES effluent limitations and permit conditions. EPA will identify such requirements and provide MMS with appropriate recommendations according to an agreed upon schedule.

B. After final procedures for inspections have been developed under the implementation section of this MOU, the Regional Minerals Manager will, upon written request from an EPA Regional Administrator, monitor and inspect OCS facilities for compliance with NPDES permits. Specific agreements between the Regional Minerals Manager and the EPA Regional Administrator implementing inspection provisions under this MOU may be set forth in a Memorandum of Agreement (MOA).

C. Any compliance sampling conducted by MMS will be in accordance with EPA's NPDES Compliance Sampling Inspection Manual. MMS will forward all compliance verifications and samples to EPA for analysis.

D. EPA retains the right to conduct compliance inspections. When EPA requires transportation to a facility, requests will be made ten (10) days in advance to the MMS so that such transportation can be coordinated with routine MMS inspection schedules. Special or emergency transportation not included in MMS inspection schedules shall be at the discretion of the Regional Minerals Manager.

E. The Regional Memorandum of Agreement will include provisions for EPA reimbursement of MMS for additional costs related to the monitoring and inspection responsibilities which MMS assumes pursuant to this memorandum. These costs will be determined following establishment by MMS and EPA of final procedures for inspections.

F. EPA will be responsible for the enforcement of all NPDES permit conditions.

VII. IMPLEMENTATION

Within two months of the effective date of the MOU, the agencies will develop an implementation plan to carry out the provisions of this MOU. This plan will take into account the following tasks and deadlines.

A. Within 3 months of completion of the implementation plan each agency will review internal procedures and regulations, and will identify whether or not revisions are necessary to accommodate the provisions of the MOU. Actual revisions of internal procedures should be completed within 1 year. Changes to regulations shall be processed in accordance with Executive Order 12291.

B. Within four months of completion of the implementation plan each Agency will: 1) develop specific recommendations and guidance to Regional personnel and staff for regulatory, permitting, and leasing activities consistent with the provisions of this MOU; and 2) develop specific recommendations to implement the provisions in Part IV.C. for the development and exchange of information including the timing of information requests and prelease studies, and the effects of long-term studies on the timing of permit issuance.

C. Within six months of completion of the implementation plan each agency will develop specific recommendations to implement the provisions of the Post Lease Monitoring, Inspections, and Enforcement portion (Part VI) of this MOU.

VIII. AGENCY CONTACTS

Inquiries regarding the provisions of this MOU, its implementation, or disagreements over any of its provisions should be directed to:

Minerals Management Service, Department of the Interior
Associate Director for Offshore Minerals Management

Environmental Protection Agency
Director, Office of Federal Activities
(General or Parts IV.C. and V)

Director, Office of Water Enforcement and Permits
(General or Parts IV A. and B. and VI)

IX. SAVINGS PROVISIONS

Nothing in this Memorandum shall be deemed to alter, amend, or affect in any way the statutory authorities of the Environmental Protection Agency or the Department of the Interior.

X. EFFECTIVE DATE

Except as provided below, this Memorandum of Understanding is effective upon the signature of the Administrator of the Environmental Protection Agency and the Secretary of the Interior. The provisions of this Memorandum and subsequent implementation documents shall be reevaluated in conjunction with each 5-year OCS oil and gas program. The Memorandum may be amended by written agreement of both agencies, or may be terminated upon 30 days written notice by either Agency. The provisions of Part IV of this MOU relating to general NPDES permits shall be effective with the completion of Part VII Implementation but no earlier than (6 months after signature).

William Clark
Secretary of the Interior

MAR 1[illegible] 1984
Date

William Ruckelshaus
Administrator, Environmental Protection Agency

MAY 31 1984
Date

APPENDIX H
Memorandum of Understanding Between the Department of Defense and the Department of the Interior on Mutual Concerns on the Outer Continental Shelf

MEMORANDUM OF AGREEMENT BETWEEN THE DEPARTMENT OF DEFENSE AND THE DEPARTMENT OF THE INTERIOR ON MUTUAL CONCERNS ON THE OUTER CONTINENTAL SHELF

I. Declaration of Intent. We, the Secretary of Defense and the Secretary of the Interior, hereby agree to establish procedures for joint use of the Outer Continental Shelf (OCS). The Department of Defense (DOD) and Department of the Interior (DOI) fully support the national goal of exploration and development of our nation's offshore oil and gas resources. The DOD recognizes that the OCS leasing program of the Department of the Interior is an integral part of the nation's energy security program to develop domestic oil and gas resources and thus is important to national defense. The Department of the Interior fully supports the requirement for DOD to use the OCS for the national defense/security and to ensure that our armed forces achieve and maintain an optimum state of readiness. We acknowledge that from time to time and from place to place the requirements for mineral exploration/development and defense related activities may conflict. In these cases, we shall reach mutually acceptable solutions to the issues raised by these conflicting requirements, in accordance with the principles and procedures established by this memorandum.

II. Procedures. Our departments agree to follow the steps and the schedule listed below:

A. The Call for Information on a proposed planning area will initiate DOD participation in a particular sale cycle. At the time the Call is issued, separate notification will be made to the DOD Executive Agent for OCS matters and will include appropriate charts, coordinates defining boundaries of the proposed area, and other data deemed pertinent to DOD analysis of the area. The DOD Executive Agent will be provided with a list of blocks and appropriate maps constituting the offering proposal identified at the time of Area Identification.

B. Within one month following Area Identification, DOD will submit a statement, along with supporting rationale, on the proposed offering which defines areas it believes require deferral from the offering or military stipulations for joint use. DOI will respond within one month after the DOD submission with agreement to accommodate DOD position or with alternative proposals and supporting rationale.

C. The Director of the Minerals Management Service (on behalf of DOI) and the DOD Executive Agent (on behalf of DOD) shall meet within the ensuing four months to approve agreements reached under (B) above and to resolve any remaining conflicts prior to the proposed Notice of Offering.

D. Issues still in conflict will be resolved by the undersigned no later than 30 days after publication of the Proposed Notice of Offering.

E. Additionally, the procedures of this memorandum will be used to resolve any conflicts that exist in lease offerings presently in the planning process.

III. Areas on the OCS requiring deferral from lease offerings. Our departments agree that, balanced against the geologic potential of an area, certain defense-related activities on the OCS may be irreconcilable with mineral exploration/development and will, under the procedures established above, be deferred from the pending lease offering. These activities are defined under this agreement as those which must take place in a particular area of the OCS due to their relation to fixed monitoring or control stations which cannot be moved except at great expense and compromise of their mission; those which relate to sensitive operations of a classified nature; and those which pose a direct danger to mineral exploration/development structures and/or personnel. More particularly, in selected instances, these may include but are not limited to:

A. Research, development, testing and evaluation (RDT&E) ranges involving hazardous weapons, which encompass but are not limited to missiles activated by radar reflectivity or heat or errant missiles whose onboard sensors seek targets of opportunity.

B. Intense operations by air, surface, or subsurface units whose activities are hazardous to non-DOD structures, equipment, personnel and which if forced to take place in close proximity to such structures would also become hazardous to DOD ships and aircraft.

C. Certain classified activities which DOD will disclose to appropriately-cleared DOI personnel.

D. Submarine transit lanes.

IV. Areas on the OCS requiring lease stipulations and lessee advisories. Our departments agree that in certain specific instances, conflicts on the OCS can be mitigated by attaching general or site-specific stipulations as a part of lease agreements or including lessee advisories. These include but are not limited to standard military stipulations for military warning areas (hold harmless, electromagnetic emission and notice of operations) and special stipulations for shelter and evacuation, time-sharing provisions, and provisions for specialized underwater research activities.

. Locus of discussions. All policy discussions and final agreements under this memorandum will be conducted in Washington, D.C., and environs, and all comment on their status or resolution will be handled by our two departments. Any public comments of a policy nature in conjunction with this agreement by officers or employees of our departments elsewhere are unauthorized.

VI. Duration of agreements under this memorandum. All deferrals, stipulations, and lessee advisories for a given area of the OCS will remain in effect for subsequent lease offerings in the same area unless altered by our two departments under the procedures outlined in this memorandum.

Secretary of Defense
20 JUL 1983

James G. Watt
Secretary of Interior
JUL 20 1983

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APPENDIX I
Steps in Offshore Leasing for Standard Sales

STEPS IN OFFSHORE LEASING FOR STANDARD SALES

EARLY COORDINATION

Before the preparation of the Call for Information and Nominations, various contacts are made by Minerals Management Service (MMS) officials with the governments of affected coastal States. These contacts are tailored for each sale and can include the following: a letter to the Governor of each affected State announcing the commencement of the planning process, including a description of the steps in the prelease process with an indication of points at which the Governor's comments will be solicited, a commitment to provide specific time and locations of scoping meetings and draft EIS hearings as soon as possible, and a copy of the most recent planning schedule; letters or phone calls to appropriate State members of the Policy Committee and the Regional Technical Working Group (RTWG); and discussions concerning the potential Call area.

IDENTIFY AREA OF HYDROCARBON POTENTIAL

At least two months before the Call for Information and Nominations is published, the MMS determines the area of hydrocarbon potential (AHP) for the upcoming sale. This is the area considered by MMS to have potential for the discovery of oil and gas.

CALL FOR INFORMATION AND NOMINATIONS; NOTICE OF INTENT TO PREPARE AN EIS

The Call, signed by the Assistant Secretary - Land and Minerals Management (ASLM) and published in the Federal Register at month 1, invites potential bidders to nominate areas and indicate levels of interest in leasing and solicits comments from States and all interested parties on any environmental effects and use conflicts as well as coastal zone consistency concerns. States and others have the opportunity to comment on areas or topics of concern that should be considered in planning the lease sale. The Call also identifies the AHP. Comments are due 45 days after the Call is published. At this time in the leasing process, consultation is begun concerning possible multiple use conflicts with the Department of Defense (DOD) activities in the sale area. Also, information is provided to affected States under section 8(g) of the OCS Lands Act.

A Notice of Intent to prepare an Environmental Impact Statement (EIS) is also published. It announces the initiation of EIS scoping and invites public assistance in determining the significant issues, including coastal zone consistency issues, and alternatives to be analyzed in the EIS on the lease sale.

The Call and Notice of Intent are sent to the Governor of each affected State by the Regional Director with a letter which invites comments on the Call. In the letter, the Governor is asked to identify issues and areas of concern which should be considered in the development of the initial leasing proposal. The Regional Director's letter also indicates interest in meeting with representatives of the State to discuss the State's comments on the Call. Possible mitigating measures to accommodate concerns may be identified at this step. Conflicts which may arise during State consistency concurrence review of plans of exploration and development and production (per section 307(c)(3) of the Coastal Zone Management (CZM) Act) may also be identified at this meeting.

Letters and/or phone calls to appropriate Policy Committee and RTWG members and section 8(g) letters are also initiated at this time by the MMS regional office.

AREA IDENTIFICATION

About 4 months after the Call is published, after the analysis of nominations and comments, MMS recommends the area to be studied in an EIS as the proposed Federal action. When the ASLM approves this proposal it becomes the Area Identification. Areas may be deleted at this stage from further study where significant multiple use conflicts exist and the potential for hydrocarbon discovery is low. After any area identification is made, the MMS provides the affected States with more detailed information concerning section 8(g) blocks if appropriate. Consultation with a State over potential section 7 boundary issues may be initiated if appropriate.

Following the announcement of Area Identification, the Regional Director provides the Governor with an explanation of what was done with the State's comments--how the comments were employed in the Area Identification process and how they will be employed in the development of alternatives and mitigating measures to be analyzed in the EIS.

In addition to providing the Governor of each affected State with an explanation of how his recommendations were used in the decision process on Area Identification and how they will be used elsewhere in the prelease process, the letter invites additional comments from the State for use in the development of the EIS. These comments are folded into the scoping process.

DRAFT ENVIRONMENTAL IMPACT STATEMENT

About one year after the Call is published, a draft EIS is issued which describes the entire planning area and focuses on the potential environmental effects of oil and gas activities in the area proposed for leasing. The EIS includes evaluation of possible future Coastal Zone Management Act (CZMA) section 307(c)(3) conflicts. For sales in the Alaska Region, the EIS also evaluates the effects on subsistence uses that could occur from leasing, exploration, and development/production of OCS oil and gas, as required by court cases interpreting section 810 of the Alaska National Interest Lands Conservation Act (ANILCA). The document also analyzes alternatives to the proposed action. The availability of the draft EIS is announced in the *Federal Register*.

PUBLIC COMMENT PERIOD

A 60-day comment period follows public availability of the draft EIS, during which time public hearings are held in the affected region. Comments received either at public hearings or in writing are considered in preparation of the final EIS.

Public hearings on the draft EIS are announced by means of a letter from the MMS Regional Director to the Governor of each affected State as well as the *Federal Register* Notice. Copies of the letter to the Governor of each affected State are sent to the appropriate Policy Committee and RTWG members.

The MMS Regional Director transmits the draft EIS to the Governor of each affected State and solicits comments on the EIS as well as substantive comments on the proposal. The letter also invites the State to participate in a meeting to discuss the State's comments. Copies of the letter to the Governor are provided to the appropriate Policy Committee and RTWG members.

FINAL ENVIRONMENTAL IMPACT STATEMENT; PROPOSED NOTICE OF SALE

The final EIS is prepared, which assesses and considers comments received during the draft EIS public comment period. These include further State and local comments on coastal zone consistency matters and, for Alaska sales, subsistence uses. A Secretarial Issue Document (SID) is prepared to analyze all issues involved in the proposed sale, again including possible coastal zone consistency conflicts that could be expected at the exploration and development stages. The proposed Notice, signed by the ASLM and generally planned to be published shortly after the filing of the final EIS with the Environmental Protection Agency, contains the proposed terms and conditions of the sale. Blocks proposed for leasing, stipulations, and other mitigating measures are listed, along with proposed bidding systems and lease terms.

As required by section 19 of the OCS Lands Act, the proposed Notice is sent to Governors of affected States with a letter requesting comments on size, timing, or location of the sale. This letter also explains how State coastal zone management program policies have been considered in decisionmaking and invites any further comment the State wishes to make. A copy of this letter is sent to the States' official contact in the coastal zone management agency and to the appropriate Policy Committee members. If the proposed sale contains blocks that are within 3 miles of the Federal/State boundary, an offer of an agreement to equitably distribute revenues from these blocks under section 8(g) of the OCS Lands Act is also made to the affected States. If there is a litigated Federal/State jurisdictional dispute involving blocks proposed for leasing in a sale, an agreement offer is made to the State at this time under section 7 of the OCS Lands Act. By this time in the leasing process, the MMS and DOD have usually reached agreement on mitigating measures and deferrals to assure compatible mutual use of a sale area.

SUPPLEMENTAL NOTICES

Supplemental Notices highlighting specific questions on a proposed sale may also be published for public response at various points in the presale process.

GOVERNORS' COMMENTS

The Governors of affected States have 60 days in which to comment on size, timing, or location of the sale. These comments are used to develop recommendations to the Secretary regarding the final Notice.

FINAL NOTICE OF SALE

After comments are received from the Governors, a final decision memorandum which analyzes all issues is prepared for the Secretary. The Secretary is to accept recommendations of a Governor if the Secretary determines that they provide for a reasonable balance between the national interest and the well being of the affected State. The rationale for this determination is to be communicated to the Governor in writing. About 90 days after the proposed Notice is published and after consideration of comments from the Governors, the Secretary issues a final Notice of Sale, if he decides to proceed. The date, timing, location, blocks to be offered, terms, and conditions of the sale are published in the Federal Register not less than 30 days before the sale is conducted.

SALE

At least 30 days after the final Notice is published, a sale is conducted by the appropriate regional office. A public opening and reading of sealed bids submitted by qualified bidders occurs.

BID ADEQUACY REVIEW

High bids for each block are evaluated after the sale to assure receipt of fair market value. The Justice Department and Federal Trade Commission also review the results to insure that awarding leases does not create a situation inconsistent with antitrust laws.

LEASES ISSUED

The Secretary has up to 90 days after receipt of bids to either accept or reject a bid. Bid acceptance has been delegated to the MMS Regional Director; normally, bids are accepted and leases issued within 1-2 months after the sale.

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